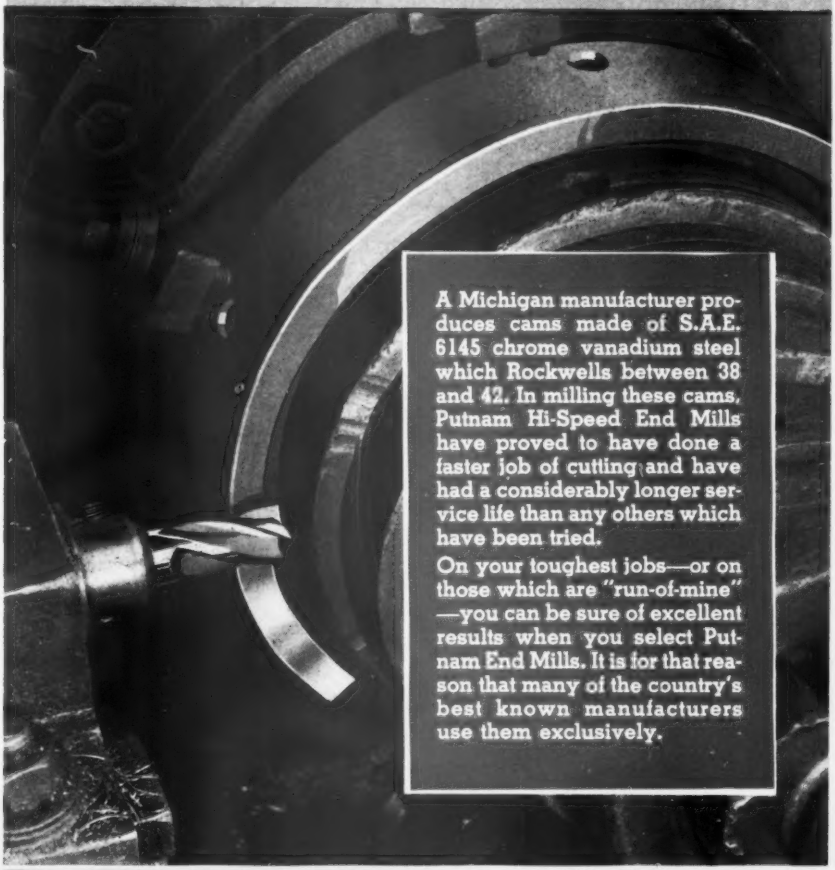
The TOOL & DIE Journal
Tool-Die-Machine PROGRESS
ARCH
941

A TOUGH MATERIAL . . . SO PUTNAM END MILLS ARE USED



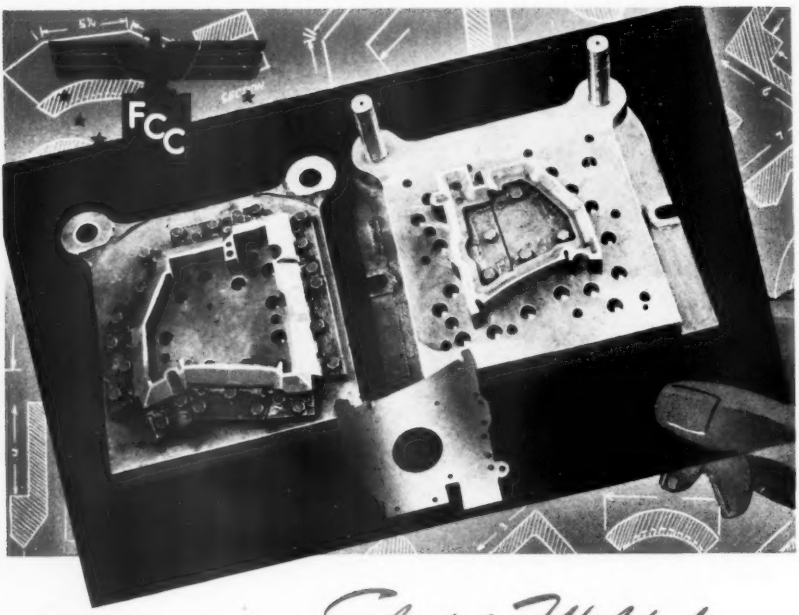
A Michigan manufacturer produces cams made of S.A.E. 6145 chrome vanadium steel which Rockwells between 38 and 42. In milling these cams, Putnam Hi-Speed End Mills have proved to have done a faster job of cutting and have had a considerably longer service life than any others which have been tried.

On your toughest jobs—or on those which are "run-of-mine"—you can be sure of excellent results when you select Putnam End Mills. It is for that reason that many of the country's best known manufacturers use them exclusively.

PUTNAM *Hi-Speed* END MILLS

PUTNAM TOOL CO. • 2985 Charlevoix Ave. • Detroit

culation
ore than
16,000

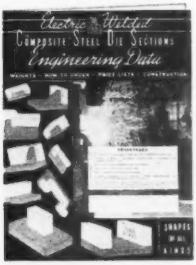


FCC

Electric Welded

COMPOSITE STEEL DIE SECTIONS offer many advantages!

Send for FCC Composite Steel Die Sections Engineering Data Folder.



1. Tool steel cutting edge backed by non-hardenable soft steel.
2. Screw and dowel holes easily drilled after machining and hardening operations.
3. Expensive lapping operations eliminated.
4. Secure fit of sections on die shoes.
5. Slight warpage easily straightened.
6. Greater hardness can be used on cutting edges because the tough, soft steel backing acts as a cushion.
7. By the use of electrically welded composite, savings of anywhere from 18% to 38% are secured over the use of bar stock tool steels, depending upon the shape and type of selections.

Construct Your Dies the FCC Composite Way

QUALITY FCC SERVICE

THE FORGING and CASTING CORPORATION

FERNDALE (DETROIT) MICHIGAN

50 YEARS

Dr. Edward Goodrich Acheson whose inventive genius in creating the first man-made grinding material gave such impetus to the development of abrasive products that they have become all important factors in making possible vastly increased production and greater precision throughout all industry.

● Never before in history has life been so enriched by scientific discovery and industrial progress as in the half century just completed. We have seen amazing strides in means of transportation . . . the automobile, the airplane, the streamlined train of stainless steel. The electric furnace has given industry new chemicals, new steels, new alloys. We have witnessed the creation of new synthetics, the perfection of the machine tool, the enormous development of mechanical efficiency in every field and the production of countless commodities that promote and protect our way of life.

Of all these varied advances none surpass the progress made in the abrasive field. When Dr. Edward Goodrich Acheson created the first man-made abrasive fifty years ago, little did he foresee that modern abrasive products would become one of industry's most important tools for the shaping, grinding and finishing of almost every device of the useful arts. It shapes the tiny balances of our watches. It smooths the massive casting. It grinds tons of wood pulp for paper making. It fashions marble and stone, finishes wood and leather and sharpens the tools of every craft.

In other words manufactured abrasives are intimately integrated with the very structure of industrial life . . . meeting its fundamental needs, furthering its progress, translating yesterday's luxuries into today's commonplace necessities.

It is with justifiable pride, therefore, that we of The Carborundum Company pay tribute to the late Dr. Edward Goodrich Acheson in commemorating the Fiftieth Anniversary of his creation of silicon carbide, trade named "Carborundum," the first man-made abrasive. It is fitting also that we choose this occasion to acknowledge the splendid cooperation of our friends in industry in bringing his work to fruition and to rededicate this Company's efforts to a continuing service to industry and to the betterment of America's way of life.

FRANK J. TONE, *President,*
THE CARBORUNDUM COMPANY,
NIAGARA FALLS, N. Y.

COPYRIGHT 1941 BY GEO. J. HUEBNER

The TOOL & DIE Journal
Tool-Die-Machine PROGRESS

Editor George J. Huebner
Assistant Editor Paul L. Reed

Circulated monthly to executives and department heads responsible for designing, building and using Precision Tooling.

Engineers, Designers, Estimators, Tool and Die Makers, Schools and Libraries may subscribe for one dollar annually.

Official Organ of the Special Tool, Die and Machine Shop Institute

Vol. 6 MARCH, 1941 No. 12

CONTENTS

Approach and Over-Run of Milling Cutters—*Walter G. Holmes* 25
Standardized Die Parts Release Machines and Skilled Men—*George Dannes* 30
Clamps and Clamping Methods for the Tool Room—*E. G. Marshall* .. 33
Mold Building Equipment and Machinery—*Gordon B. Thayer* 40
More Careful Handling of Small Tools is Imperative—*Charles J. Koebel* 44
We Change Our Name—*George J. Huebner* 45
Recent Industry Publications 60, 62
Buy with Confidence 69–74
Contract Shops 78, 79
Advertisers' Index 92

The TOOL & DIE Journal
GEORGE J. HUEBNER, *Publisher*
2460 Fairmount Boulevard Cleveland, Ohio

REPRESENTATIVES

NEW ENGLAND
J. McA. Johnson
1501 Beacon St., Brookline, Mass.
Telephone: Aspinwall 8480

METROPOLITAN NEW YORK
Macfarland & Heaton
289 Fourth Ave., New York, N. Y.
Telephone: GRamercy 5-2380

MICHIGAN
R. F. Pickrell
4273 Tyler Ave., Detroit, Mich.
Telephone: HOgarth 7603

MID-WESTERN
L. B. Hammond
123 W. Madison St., Chicago, Ill.
Telephone: RANdolph 1843

Standardize ON HOLO-KROME

Completely Cold Forged
FIBRO FORGED
Socket Screws

Every one of the new features which characterize **FIBRO FORGED** Socket Screws is the result of a clear understanding on the part of Holo-Krome Engineers and Metallurgists as to the present day needs of Socket Screw Users.

The patented method by which **FIBRO FORGED** Screws are made —Completely Cold Forged with continuous unbroken fibres—is the first major advancement in the manufacture of Socket Screws to meet the demand of modern increased production and high speed machinery.

New "satin-smooth" lustrous Black Finish—an outstanding characteristic of Holo-Krome **FIBRO FORGED** Screws—the Quality Socket Screws meeting industry's demand for a superior finish.

Holo-Krome steadfastly adheres to their policy of constant research to give Socket Screw Users the greatest possible value.

Try them—Holo-Krome Guarantees
UNFAILING PERFORMANCE

HK HOLO-KROME
fibro forged

THE HOLO-KROME SCREW CORP. **SOCKET SCREWS** HARTFORD, CONN. U.S.A.

TOOL ENGINEERS

. . . Let Norton Share Your Grinding Worries

THERE'S no time now in the tool engineer's day for details such as tool sharpening. But near you there is a Norton engineer ready to tackle the grinding jobs.

Sharpening High Speed Steel Tools—

For grinding high speed tool steels and similar alloys the Norton engineer will recommend the special "B-E" bond and one of the Norton fused alumina abrasives—Alundum, 19 Alundum, 38 Alundum or 57 Alundum. Grain, grade and structure selection will depend on the details of each job.

Sharpening Cemented Carbide Tools—

For off-hand grinding of single point cemented carbide tools he will recommend the Norton-developed metal bonded diamond wheel—strong, heat-resistant and extremely long lived. For tool and cutter grinding of multi-blade carbide tools it will be the fast cutting resinoid bonded diamond wheel.

Finishing Dies—

For the countless finishing jobs on dies, molds and tools he has nearly 200 standard sizes and shapes in the Norton line to select from—fast cutting 38 Alundum wheels and points with spindles of stainless steel.

W-800B

NORTON ABRASIVES

Cutting Bars,

Tubing, Plastics,

Broken Tools—

RESINOID BOND is usually first choice for metals when a fast cutting action, plus long wheel life are desired and where some burr is not objectionable; also for the dry cutting and slotting of concrete, plastics, fibre and other non-metallic materials. Norton research combined with Norton control in manufacture have resulted in a Norton Resinoid Cut-off Wheel that is outstanding in performance.

RUBBER BOND is the choice where minimum burr is essential and for most wet cutting jobs—both metallic and non-metallic materials. For this work, too, Norton research has developed an outstanding wheel.

SHELLAC BOND is most used in the tool room where its soft, free grinding action is an advantage in cutting tool steels without discoloration.

You can be sure that one or more of these Norton bonds with either Alundum or Crystolon abrasive will handle your cut-off jobs. And a Norton engineer will be glad to help you.

Take advantage of this complete Norton Tool Room Service —let it work for you these busy days.

NORTON COMPANY
WORCESTER, MASS.

New York Chicago Detroit
Philadelphia Pittsburgh Hartford
Cleveland Hamilton, Ont.

W-801

NORTON ABRASIVES

YOU HAVE TO KNOW THE FUNDAMENTALS TO GET *"Results"*

But that's all you do have to know to get *superior* results with Graph-Tung, Graph-Mo, Graph-Sil, Graph-Al and Graph M. N. S. steels.

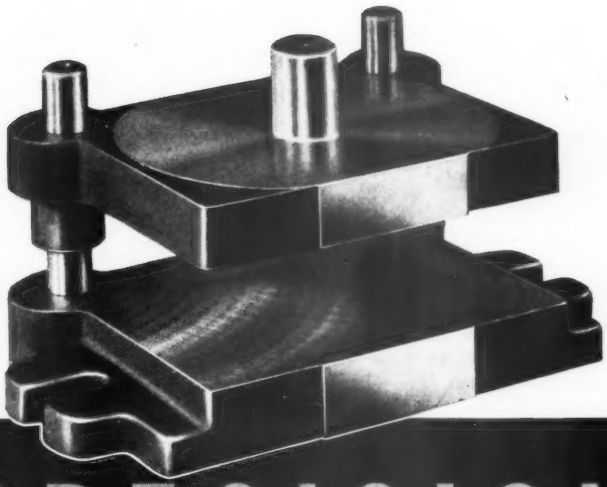
An ordinary tool steel die produced 50,000 pieces per grind and had to be discarded after producing 1,000,000 pieces. A Graph-Mo die now being used on the same job has produced 176,000 smoother, scratch-free pieces without regrinding. Anticipated life of the Graph-Mo die on the basis of this performance is 3,000,000 pieces.

Let us tell you more about these free machining, wear resisting steels. Ask for the Graphitic Booklet. It shows many specific applications of TIMKEN Graphitic Steels.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO
Steel and Tube Division

TIMKEN
ALLOY STEELS

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; and TIMKEN Rock Bits.



PRECISION

IS THE KNOWN QUANTITY
OF DEPENDABLE ACCURACY
THAT SAVES MONEY IN
DIE MAKING—AND
STAMPING PRODUCTION

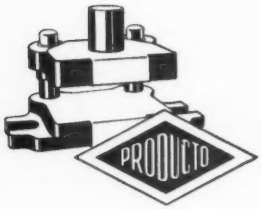
WRITE YOUR DANLY BRANCH

DANLY MACHINE SPECIALTIES, INC.

2121 So. 52nd Ave. • Chicago, Ill.

513 E. Buffalo Street, Milwaukee, Wis.
36-12 34th St., Long Island City, N. Y.
990 E. Monument Ave., Dayton, Ohio
1549 Temple Avenue, Detroit, Mich.
16 Commercial Street, Rochester, N. Y.
1745 Rockwell Ave., Cleveland, Ohio
3913 North Broad St., Philadelphia, Penna.
Ducommun Metals & Supply Company, Los Angeles, Calif.; San Francisco, Calif.

DANLY DIE SETS and DIE MAKERS' SUPPLIES

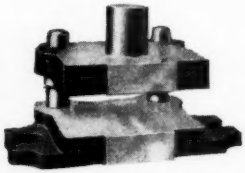


Faster, Better Service on

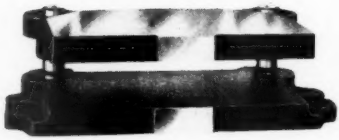
PRODUCTO DIE SETS AND ACCESSORIES

Fast, complete service on Producto Master and Standard Interchangeable Die Sets and Accessories is now available throughout the country.*

A complete line of steel or semi-steel Producto Interchangeable Die Sets for mounting dies, for power presses, plastic molds and die castings dies can now be delivered within 12 to 24 hours. For example, 35 sizes of 200 standard Rear Two Pin Die Sets and 14 sizes of 90 Master Progressive Die Sets are regularly carried in stock.

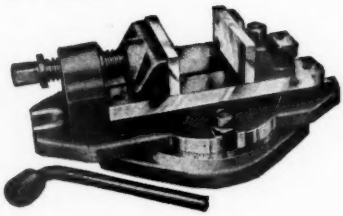


Tools and attachments for power presses and tool rooms include Bolster Plates, Guide Pins, Bushings, Dowel Pins, Square or Oval Wire Springs, Stripper Bolts, Socket Head and Socket Set Screws, Torch Cutting and Welding Steel Plate. Accessories also include Dickerman Hitch Feed, Bay State Hand Tapper and Handy Vise.



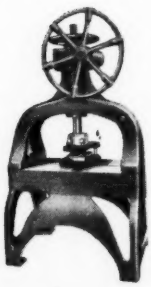
Producto Machine Vises

Producto Machine Vises for the tool room include the new 4½" vise (illustrated, right). With bodies of semi-steel, reinforced with hardened and ground wearing surfaces, these vises have jaws adjustable in any desired position and provide an extra large opening.



Producto Utility Press

The Producto Utility Press is a versatile general purpose tool room machine. A 50-ton capacity hand screw press, the Producto Utility Press is convenient, fast, sturdy and adaptable to many operations.



*A complete list of manufacturing, assembly and warehouse points is included in the new 100-page Producto Catalog No. T.

You are cordially invited to visit us at the A.S.T.E. Show, Booth No. 324.

THE PRODUCTO MACHINE CO.

992 HOUSATONIC AVE. **BRIDGEPORT, CONN.**

3017 Medbury Ave., Detroit, Mich.

TUNGSTEN CARBIDE TIPPED TOOLS

To Your Print!

Whether it's a single or multi-tipped tool, whether or not you have a print of the specific tool you need, Ex-Cell-O can give you exactly what is required in a tungsten carbide application . . . The engineers of Continental Tool Works—a division of Ex-Cell-O—will gladly place at your disposal a long and varied experience in creating special tools tipped with tungsten carbide . . . *to your part print.*

EX-CELL-O CORPORATION
CONTINENTAL TOOL WORKS DIVISION
1206 OAKMAN BLVD. DETROIT, MICHIGAN

EX-CELL-O CORPORATION
1206 Oakman Blvd., Detroit, Mich.
Send me Bulletin No. 11281 on Carbide Tipped Tools.

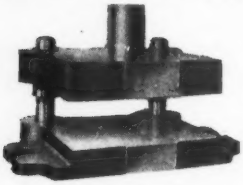
Name.....

Company.....

Address.....

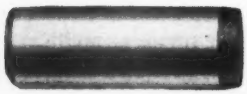
EX-CELL-O (XLO) *Precision* **MACHINES AND TOOLS**

If It's for the Die Shop, We Have It!



Producto Master and Standard Interchangeable Die Sets

steel and semi-steel—Special Die Sets.
Leader Pins—Bushings



Hardened and Ground Steel Dowel Pins. Size range $\frac{3}{32}$ x ½ to 1 x 6 standard .0002—oversize .001—.002.

Socket Head Cap Screws, Hollow and Square Head Set Screws and Socket Head Stripper Bolts.

Flat, Round and Square Wire Die Springs.

Positive spring washers; to fit Socket Head Cap and Stripper Screws.

Cerromatrix
Cerrobend
Cerrobase

Low-temperature-melting metal alloys for locating and securing punch and die parts. Economical, saves time, reduces cost.

HARDSTEEL TRADE MARK DRILLS

Distributor of Hardsteel Drills

The new revolutionary drills, designed for use on hardened parts where ordinary drills cannot be used—drills hardened boring bars and tempered spring steel. Hardsteel Drills will cut through armor plate.

Complete line of Die Makers' supplies in stock at our Cleveland warehouse and assembly plant.

Prompt, Dependable Delivery Service

DIE SUPPLY COMPANY

J. R. Fitzsimmons — W. H. Fitzsimmons — Jos. T. Fitzsimmons

Telephone CHerry 6818

1390 East 30th St. -:- Cleveland, O.

THE *Precision* REQUIRED FOR MODERN INDUSTRY

South Bend Lathes are designed and built to provide the extreme precision required in modern industry. They are giving tool room accuracy on close-tolerance production work in hundreds of manufacturing plants throughout the United States. The smooth, vibration-free belt drive to the spindle permits finish turning or boring with such precision that subsequent grinding, honing or lapping operations can often be eliminated.

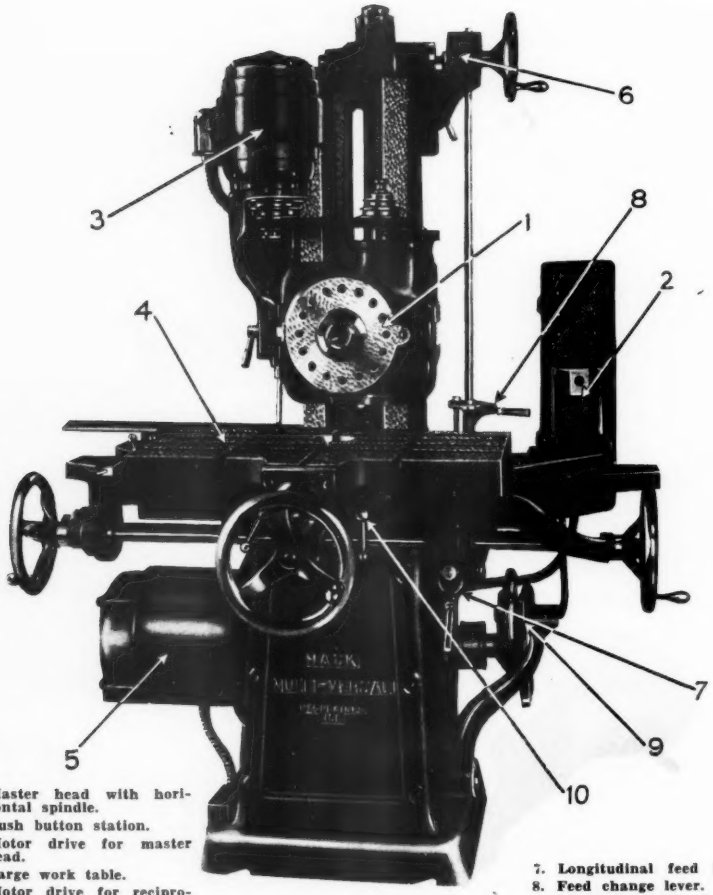
South Bend Lathes are made in 9", 10", 13", 14½" and 16" swing, in 3' to 12' bed lengths, in Motor Drive and Countershaft Drive.

SOUTH BEND LATHES

SOUTH BEND LATHE WORKS

LATHE BUILDERS SINCE 1906

200 E. Madison St., South Bend, Ind., U.S.A.



1. Master head with horizontal spindle.
2. Push button station.
3. Motor drive for master head.
4. Large work table.
5. Motor drive for reciprocating ram.
6. Elevating mechanism and feed lever.
7. Longitudinal feed lever.
8. Feed change lever.
9. Duplicator control device.
10. Square-way lock-up handles.

VIEW SHOWING BASIC MACHINE FROM OPERATOR'S POSITION

The MULTI-VERSAL is new in design and does not follow the general pattern of any other type of standard machine tool. Designed to perform as a multi-purpose machine tool, and to make possible the practical application of the machine to both reciprocating and rotary cutting. Built-in features consisting of the reciprocating ream ram, and the master head represent a distinct departure from conventional machine features, greatly reducing the number of attachments needed, but increasing the applications. Rapid conversion must not be confused with the usual delay experienced setting up cumbersome attachments on other machine tools.

THERE IS NO SUBSTITUTE FOR THE HACK MULTI-VERSAL

PROGRESS—For the past five years, the HACK MULTI-VERSAL has steadily progressed toward its goal as a super-efficient universal machine tool.

POPULARITY—In its history making achievement, the MULTI-VERSAL has gained a popularity of such proportions as to eliminate any misconceptions regarding its investment value as a necessary modern machine tool.

CONVERSION vs. SET-UP-TIME LOSSES—Because of its new economic principle of rapid conversion, it challenges as inefficient much of the old familiar practice of transferring from bench to machine, and from machine to machine with the usual set-up-time losses.

SIMPLICITY—No prior acquaintance with the MULTI-VERSAL is necessary. Its operation is simply a matter of common sense.

ADAPTABILITY—It is a "natural" so far as the workman is concerned, for his mechanical habits and impulses direct him automatically in its operations.

FOCUSED CONTROL—After taking the normal working position before the machine, the workman need not move one step to put the machine proper through its paces, because the focused control feature gives him instantaneous selection of speed and feed controls.

DOING THE JOB—Hack MULTI-VERSALS are found in some of the world's finest laboratories and tool rooms, reducing machining costs 25% to 35%; each doing a phenomenal job on intricate precision work, while winning the admiration of its operators and owners.

WHAT USERS SAY:

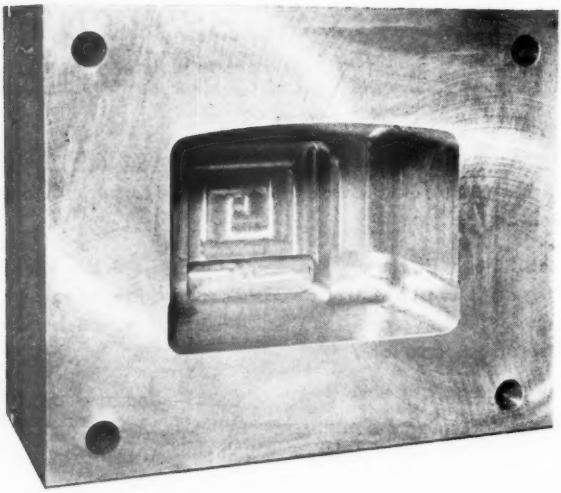
"Five years ahead of industry" says one user.

"Handiest machine we have in the shop" says another.

Canadian Defense Education—"An ideal machine to rapidly train apprentices in the principles of machine and tool shop practices."

"Ship three machines as quickly as possible" says a third user.

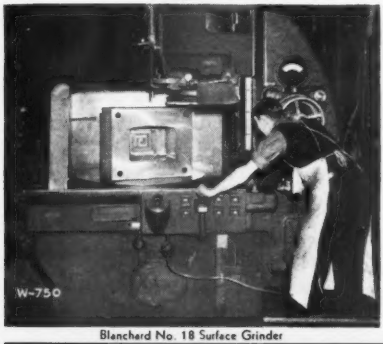
1230 HARDING Desplaines, Ill.



Cost Cut in Half

1/16" stock is ground from all outside surfaces of this 18" x 22" x 11" die on a Blanchard No. 18 Surface Grinder at half the previous cost.

BLANCHARD



Blanchard No. 18 Surface Grinder

Costs are vital in peacetime — production is vital for defense work — accuracy is always important. Blanchard Grinders meet these requirements — shops that have Blanchards can be *sure* of machining their flat surface work accurately, rapidly, and at lowest cost.

For most work no tooling is required, set-up time is a matter of minutes, and there is practically no lost time between jobs. The quantity of varied work that can be profitably machined on a No. 18 Blanchard Grinder is a revelation to those not familiar with this machine.

If you are interested in speeding production and cutting cost of machining flat surfaces, send us prints or samples of your work for production estimates.

This booklet, "Work Done on the Blanchard," shows over 100 jobs with production data. Send for your copy today!

THE BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE, MASSACHUSETTS, U. S. A.

TANNEWITZ DI-SAWS

Do in MINUTES *jobs which otherwise require* HOURS!

Conservatively estimated TANNEWITZ DI-SAWS save an average of 70% of the time and cost involved in making inside and outside cuts on dies, shoes, templates and the hundreds of other operations, including filing and polishing, to which these machines are ideally adaptable. In many instances they are turning out work in as little as ONE-TENTH of the former time required.

To expedite production and cut costs, by all means investigate the tremendous possibilities these machines offer in tool and die making and other applications.

The popularity of DI-SAWING is growing by leaps and bounds. Get the complete facts on the most highly developed DI-SAW on the market. Simply write for our DI-SAW Bulletin.

SAWING SPEEDS PER MINUTE					
THICKNESS	CAST IRON	COLD ROLLED	TOOL STEEL	HI SPEED STEEL	HI CHROME HI CARBON
¼″	16″	9″	5″	2⅜″	1½″
½″	8″	4½″	2½″	1⅛″	¾″
1″	3½″	2¼″	1¼″	½″	⅜″
1½″	2″	1″	⅝″	5/16″	3/16″
3″	1″	½″	5/16″	5/32″	3/32″
6″	½″	¼″	5/32″	5/64″	1/32″

Made by Sawing Machinery Specialists

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

The National Defense Program

Demands the Best of Every Organization

It is a matter of pride with us that our facilities, built up over a period of years, are so well adapted to the needs of this Program.

●

Builders of Machines, Dies, Jigs, Fixtures, Tools and Gages.

●

General Machine Work

●

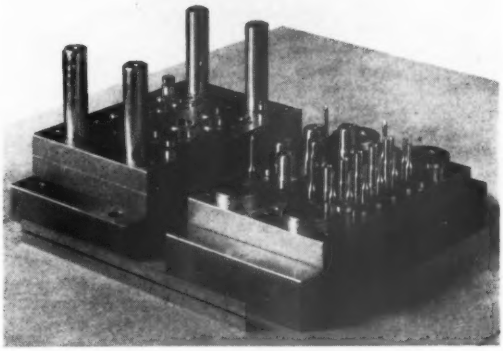
Manufacturers of Precision Parts and Complete Products to order.

THE BUNELL MACHINE & TOOL COMPANY

1620 East 24th Street Cleveland, Ohio

Save Tooling Time with HOVIS Standard Punches and Dies

Use Hovis Standardized Die and Punch Parts. They are *ready* to use—guaranteed the precision-fit you specify and you *know* their cost beforehand.



A typical Hovis Die which includes *quickest change* Screwlock Retainers, Punches and Buttons.

•

HOVIS Retainers, Punches and Die Buttons save die-making time—their Screwlock *quickest change* feature is insurance against press down-time.

•

Catalog and Prices Sent Promptly on Request

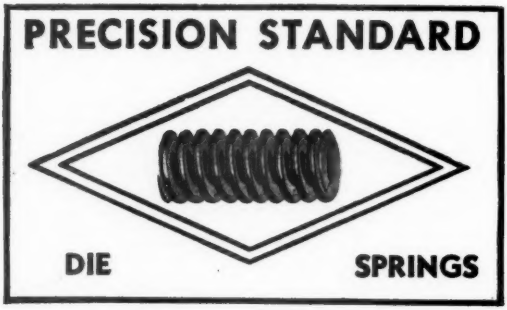
HOVIS SCREWLOCK COMPANY

8100 E. Nine Mile Road Van Dyke, Mich. (Suburb of Detroit)

Now Your

PRECISION-STANDARD DIE SPRINGS

are Packed in Cartons with this Label



For many years *Precision-Standard* P·S *Die Springs* have been designed and manufactured to meet the most exacting requirements of die, tool, jig and fixture builders.

Precision-Standard Die Springs have continuously assured stamping and forging manufacturers and all die users of longer spring fatigue life and trouble-free die operation.

They have been approved and adopted as standard by leading automotive manufacturers.

All *Precision-Standard Die Springs* are now available in cartons to enable you to select sizes quickly and to maintain stocks complete and orderly.

Standardize on P·S **Die Springs**

Send for complete Catalog

PRECISION SPRING CORPORATION

15400 WOODROW WILSON AVE. DETROIT, MICHIGAN

Coiled and Flat Springs for Every Purpose

SAFETY PLUS
-efficiency and accuracy!

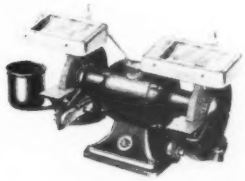
Here is a grinder that can be used by even the most inexperienced operator with a minimum of risk. Wheels are balanced to within 1/100 inch ounce to insure vibrationless performance. The new Twin-Lite Safety Shields and lamp attachments flood the wheels and work from both sides, permitting much more accurate grinding and making the grinder independent of the shop lighting system. Quickly replaceable bulbs (two in each shield) are thoroughly ventilated and fitted with polished reflectors. Ball bearings are lubricated for their entire life . . . accurate tool supports . . . strong and adjustable spark guards . . . these are only some of the features found in these remarkable grinders.

The Rifle Bullet Test!

To test the strength and completeness of the guarding of these grinders, a number of wheels were deliberately smashed with a rifle bullet while the grinder was running at speeds from 3400 to 8000 R.P.M. Photo at the left shows one wheel that was smashed at the highest speed. The spark guard was slightly bent, and that was all. That's safety plus!

Also Bench and Belt Driven Models

Built in both single phase and three phase models, bench and pedestal types, motor and belt-driven, there is a Delta grinder to fit every shop. The motor-driven bench grinder also incorporates all of the latest Delta design and construction features.



By the Makers of Delta Drill Presses

Advanced design and modern production methods have won world-wide acceptance of Delta single and multi-spindle drill presses.

Send for Special Bulletin

Fill out coupon below for full details, specifications and prices on this new Delta Grinder.

The DELTA MFG. CO.
(INDUSTRIAL DIVISION)
640 E. Vienna Ave., Milwaukee, Wis.

Delta Mfg. Co. (Industrial Division)
640 E. Vienna Ave., Milwaukee, Wis.

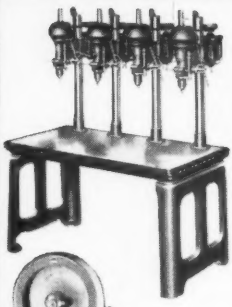
Please rush to me full details and prices on the new Delta Grinder. Also send copy of latest Delta Catalog of **Industrial Production Machine Tools.**

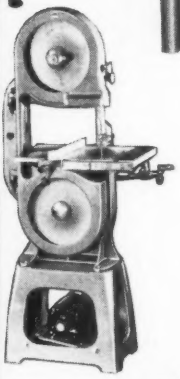
NAME .....

ADDRESS .....

SMASH THIS *Barrier*

With DURO TOOLS





If your shop suffers from a shortage of precision-built machines for fabrication of hundreds of small parts needed in the National Defense Program—

If production barriers are cropping up in your plant due to lack of enough machinery—

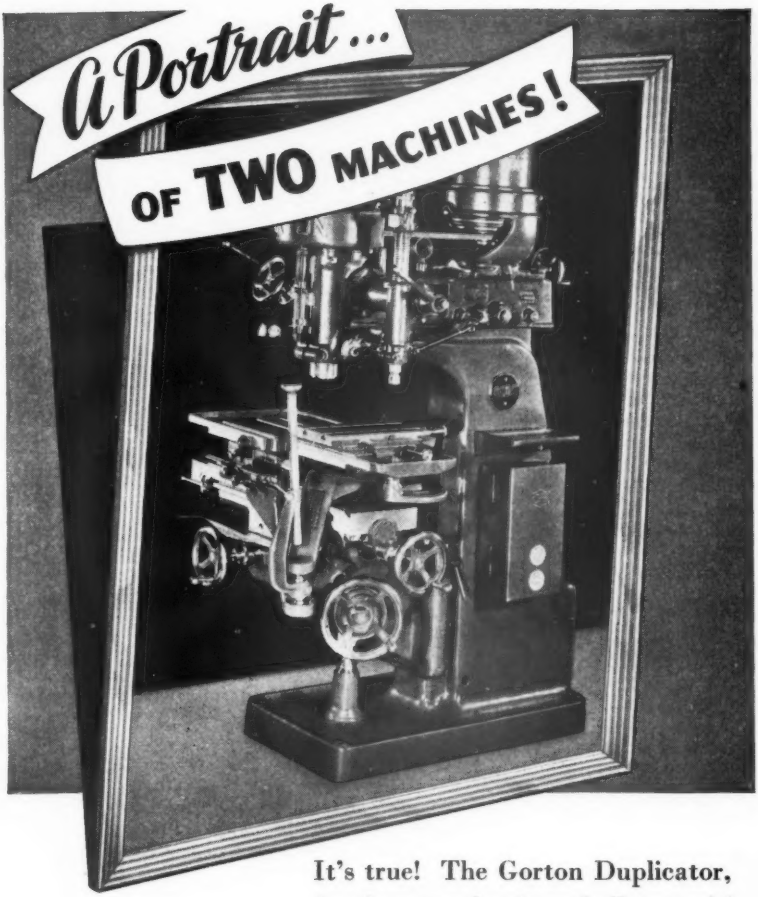
If your big machines are tied up because they have to handle both the large and small jobs—

Then you too can smash through these barriers. Duro Tools, at a very low cost, will help restore the stream of materials to flow smoothly and continuously for you as they do for many other manufacturers.

There are many places in your shop where Duro Tools will take the place of your big machines to speed up the work going over your production line.

We can't tell you the whole story here but we invite you to visit BOOTH 120 during the A.S.T.E. Exposition in Detroit—March 25 to 29. We'll explain in detail how Duro Tools will fit into your plant.

DURO METAL PRODUCTS CO.
DEPT. TP-2
2649 N. KILDARE AVE., CHICAGO, ILL.



It's true! The Gorton Duplicator, for the reproduction of all types of dies and molds, is in reality two machines. The removal of the duplicator table—a moment's work—converts the Duplicator into a high speed vertical milling machine for the tool room or for light production work.

For full information write today for Bulletin 1319-B.

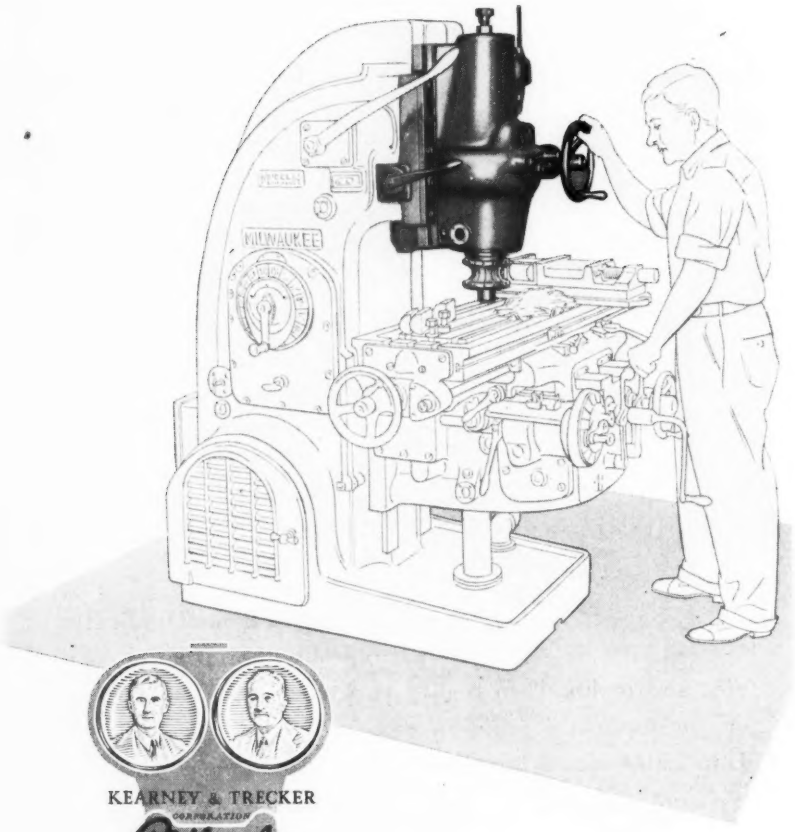
GORTON

GEORGE GORTON MACHINE CO.

1319 RACINE STREET, RACINE, WISCONSIN, U. S. A.

The spindles of Milwaukee Vertical Milling Machines have the same powerful drive as those of the horizontal models . . . with the spindle gears mounted solidly on the spindle. Thus power is delivered to the spindle through low torque, high speed shafts.

KEARNEY & TRECKER CORPORATION • Milwaukee, Wis., U. S. A.



KEARNEY & TRECKER
CORPORATION
Milwaukee
MILLING MACHINES

MILWAUKEE MILLING MACHINES

The TOOL and DIE Journal

TOOL—DIE—MACHINE PROGRESS

MARCH, 1941 Vol. 6, No. 12

Approach and Over-Run of Milling Cutters

Including a Table of Relative Values and Formulas for Calculations

Walter G. Holmes
Standards Engineer
The Timken-Detroit Axle Co.

This is another excerpt from the Holmes treatise on Cutting Tools. The Table of Relative Values and Formulas for Calculations were chosen to give our readers a clear idea of the comprehensive and thoroughly practical nature of this information. All data is based on the most modern shop practice and has been checked by men competent to judge both design and performance of cutting tools.

Conditions of Approach

THE milling cutter does not operate at full efficiency as it builds up to the full depth of the cut or during the time that the cutter passes out of the full depth area. The approach or over-run distance must be considered a part of the distance traveled by the cutter as the necessary service is rendered. Either one or both must be added to the length of the part to obtain the length of cut, that is, the length of the cutter travel. In these calculations the length of the part may be considered as a single part or as several parts held in a group, as at K, L, M, Fig. 4-25, Table 4-2. The milling method—face, slab or straddle—and the shape of the part will determine the use of the approach or over-run distance values in calculating the length of the cut. These cases are shown in the table.

The diameter of the cutter will also determine the approach or over-run distance. In Fig. 4-21, the over-run distance B is at a maximum when the cutter diameter is equal to the width of the part. As the cutter diameter is increased to a size larger than the part width the distance B is decreased. Hence for face milling the larger diameter cutter will reduce the length of the cut. The use of the smaller diameter cutter will lead to other economies as compared to a larger diameter cutter. The feed per tooth may be the same for each diameter cutter, being determined for finish requirements rather than by the strength of the teeth. The revolution marks upon the finished surface may remain with the same spacing between them but the revolutions of the smaller cutter are faster and therefore the inches per minute will be greater and the milling time will be reduced. Where a small cutter has sufficient teeth so that the proper number of teeth are always in the cut and the diameter is sufficient for the necessary cutter

strength, a small cutter requires a smaller investment and power provision. A large diameter cutter will prove to be the most economical for finish milling.

In Fig. 4-22, Table 4-2, the large diameter cutter may often be used to cover the area of the part with a length of cut equal to the length of the part. In Fig. 4-25, the slab milling cutter and in Fig. 4-27, the straddle milling cutter readily show, as the cutter diameter is increased, that the approach and over-run distances are increased, that the length of cut becomes longer, and that a minimum cutting distance and time are attained by using a minimum diameter cutter. The percentage of time saved by using a particular cutter diameter is controlled to some extent by the length of the cut. Where the length of the part is increased it is evident that the savings will not be in the same proportion.

Length of Cut

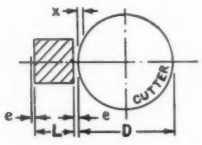
The usual face milling operation is carried on as shown in Fig. 4-21, Table 4-2. Here the over-run distance B is added to the length of the part to obtain the length of the cut. In cases where accuracy is required or deep cuts are taken the approach distance E for the depth of cut F must also be added to the length of the cut. A table on Length and Angle of Chamfer on Reamer or Tap is used for the values of E and F of angular cutters. Table 4-2, Approach and Over-run of Milling Cutters, Fig. 4-25, is used for the length of approach for rounded corner cutters.

The relative position of the part and end contours of the part as compared to the center line of the face mill, will determine the least cutting length. Figs. 4-21, 4-22, 4-23 show how the part and cutter are relatively positioned to take advantage of the part contour. In Fig. 4-22 the area G of the part is covered without over-run of the large size cutter which is placed with its center line along the longer length of the part. Fig. 4-23 shows a compromise where a smaller cutter must be used. Here the distance A is calculated so that the points E and F are upon the cutter outline as the cut is completed. Fig. 4-24 shows the condition where the cutter must pass completely over the part in order to obtain a maximum of surface finish.

A Formula for Straight Line Milling

L= Length to be machined, in inches. (See Fig. 4-19)
X= Cutter approach (see Table 4-2, Approach and Over-Run of Milling Cutters)
N= RPM of spindle
F= Table feed in inches per spindle revolution
H= Table feed in minutes per inch
G= Table feed in inches per minute
T= Time in minutes to complete the cutting operation
S= Cutting speed in FPM
D= Diameter of milling cutter, in inches
M= Number of teeth in cutter
E= Table feed in inches per tooth
e= idle feed to cut and pass end of part. Allow approach length of $\frac{1}{32}$" for cut-to-length stock and $\frac{1}{16}$" for castings or forgings. Allow .020" for hand approach of small cutters to .050" for hand approach of large cutters.

Fig. 4-19



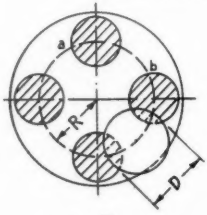


Fig. 4-20

$H = NF$ $\quad F = \frac{H}{N}$ $\quad E = \frac{F}{M}$ $\quad H = \frac{I}{G}$

$I = GH$

$F = EM$ $\quad G = \frac{I}{H}$ $\quad N = \frac{H}{F}$ $\quad M = \frac{F}{E}$

(Continued on Page 55)

Table 4-2. Approach and Over-Run of Milling Cutters

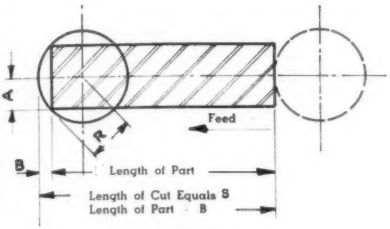


Fig. 4-21 Face Milling

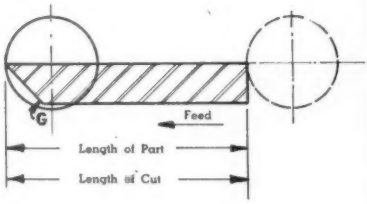


Fig. 4-22 Face Milling

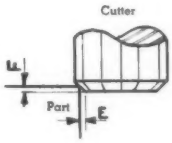


Fig. 4-26
Round Nose Lathe Tool

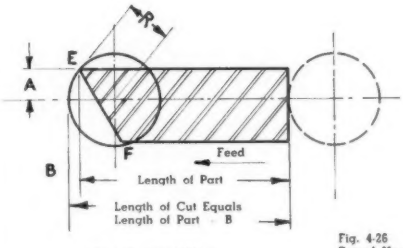


Fig. 4-23 Face Milling

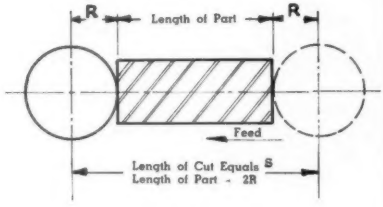
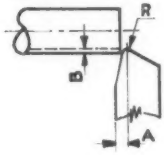


Fig. 4-24 Face Milling



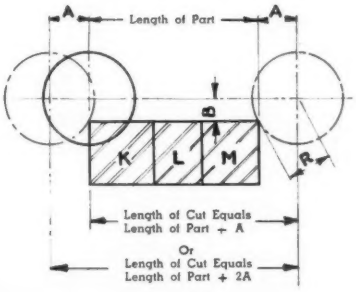


Fig. 4-25 Straddle
or Slab Milling

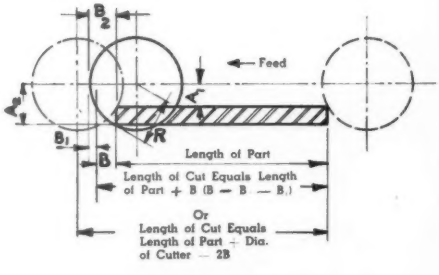


Fig. 4-27 Straddle Milling

Approach and Over-Run of Milling Cutters

Table 4-2 Cont'd., to be used in conjunction with Drawings on Page 27.

$A=\sqrt{R^2-B^2}$ — **Table of Dimension A** — $B=\sqrt{R^2-A^2}$

D= DIA.	R= RAD.	Depth of Cut = B																				
		.010	.020	.030	.040	.050	.060	.080	.100	.125	.187	.250	.312	.375	.437	.500	.625	.750	1.000	1.250	1.500	1.750	2.000
	.010																						
	.015	.014																					
	.020	.017																					
	.025	.020	.024																				
	.030	.022	.029																				
	.040	.026	.035	.039																			
	.050	.030	.040	.046	.049																		
1/8	.062	.034	.046	.053	.058	.061																	
5/32	.078	.038	.052	.061	.068	.073	.076																
3/16	.094	.042	.058	.069	.077	.083	.088	.093															
7/32	.109	.046	.063	.075	.084	.092	.097	.105	.109														
1/4	.125	.049	.068	.081	.092	.100	.107	.117	.122														
9/32	.140	.052	.072	.087	.098	.107	.115	.127	.134	.139													
5/16	.156	.055	.076	.092	.104	.114	.123	.136	.146	.153													
11/32	.172	.058	.080	.097	.110	.121	.130	.145	.156	.165													
3/8	.187	.060	.084	.102	.116	.127	.137	.153	.166	.176													
13/32	.203	.063	.088	.106	.121	.133	.144	.161	.175	.187	.202												
7/16	.219	.065	.091	.111	.126	.139	.151	.169	.184	.198	.217												
15/32	.234	.068	.093	.115	.131	.145	.156	.176	.192	.207	.229												
1/2	.250	.071	.098	.119	.136	.150	.162	.183	.200	.217	.242												
9/16	.281	.074	.104	.127	.145	.160	.174	.196	.215	.234	.265	.279											
5/8	.312	.078	.110	.133	.153	.169	.184	.209	.229	.250	.286	.306											
11/16	.344	.082	.116	.140	.161	.179	.194	.221	.243	.265	.306	.331	.343										
3/4	.375	.086	.121	.147	.169	.187	.203	.232	.255	.279	.325	.354	.370										
13/16	.406	.089	.126	.153	.176	.195	.213	.242	.267	.293	.342	.375	.395	.405									
7/8	.437	.093	.131	.159	.183	.203	.221	.252	.278	.306	.358	.395	.419	.433									
15/16	.469	.096	.136	.165	.190	.211	.230	.262	.289	.319	.375	.415	.442	.459	.468								
1	.500	.099	.140	.171	.196	.218	.238	.271	.300	.331	.390	.433	.463	.484	.496								
1 1/8	.562	.106	.148	.181	.208	.232	.253	.289	.320	.353	.419	.467	.503	.530	.548	.559							
1 1/4	.625	.111	.157	.191	.220	.245	.267	.306	.339	.375	.446	.500	.541	.573	.596	.613							

1 3/8	.687	.117	.165	.201	.229	.257	.281	.322	.357	.395	.471	.530	.575	.612	.640	.661	.684							
1 1/2	.750	.122	.172	.210	.242	.269	.294	.337	.374	.415	.496	.559	.609	.650	.682	.707	.739							
1 5/8	.812	.127	.179	.219	.252	.281	.306	.351	.390	.433	.518	.586	.640	.684	.720	.750	.790	.810						
1 3/4	.875	.132	.186	.227	.262	.292	.318	.366	.406	.451	.541	.612	.670	.718	.757	.791	.844	.866						
1 7/8	.937	.137	.193	.236	.271	.302	.330	.379	.421	.468	.562	.637	.698	.750	.792	.829	.884	.917						
2	1.000	.141	.199	.243	.280	.312	.341	.392	.436	.484	.582	.661	.726	.781	.826	.866	.927	.968						
2 1/8	1.062	.145	.205	.251	.289	.322	.352	.404	.450	.500	.602	.684	.752	.810	.859	.901	.968	1.015	1.060					
2 1/4	1.125	.150	.211	.257	.297	.332	.363	.417	.464	.515	.621	.707	.778	.838	.890	.935	1.008	1.061	1.118					
2 3/8	1.187	.154	.217	.265	.306	.341	.372	.428	.477	.530	.640	.729	.802	.866	.920	.968	1.046	1.104	1.172					
2 1/2	1.250	.158	.223	.272	.314	.350	.383	.440	.490	.545	.658	.750	.826	.893	.949	1.000	1.083	1.146	1.225					
2 5/8	1.312	.162	.228	.279	.321	.359	.392	.451	.502	.559	.675	.770	.849	.918	.978	1.031	1.118	1.186	1.274	1.311				
2 3/4	1.375	.166	.234	.286	.329	.367	.402	.462	.515	.573	.692	.791	.872	.944	1.005	1.060	1.152	1.225	1.323	1.369				
2 7/8	1.437	.169	.239	.292	.337	.376	.411	.473	.527	.586	.709	.810	.894	.968	1.032	1.090	1.186	1.262	1.369	1.425				
3	1.500	.173	.244	.298	.344	.384	.420	.483	.539	.599	.725	.829	.916	.992	1.058	1.118	1.218	1.299	1.414	1.479				
3 1/8	1.562	.176	.249	.305	.351	.392	.429	.493	.550	.612	.741	.848	.937	1.015	1.084	1.145	1.250	1.334	1.457	1.531	1.561			
3 1/4	1.625	.180	.254	.311	.358	.400	.438	.504	.561	.625	.757	.866	.957	1.038	1.109	1.173	1.281	1.369	1.500	1.581	1.620			
3 3/8	1.687	.183	.259	.317	.365	.408	.446	.513	.572	.637	.772	.884	.977	1.060	1.133	1.199	1.311	1.403	1.541	1.630	1.677			
3 1/2	1.750	.187	.264	.323	.372	.415	.454	.523	.583	.650	.787	.901	.999	1.083	1.157	1.225	1.341	1.436	1.581	1.677	1.732			
3 5/8	1.812	.190	.269	.328	.379	.423	.462	.532	.594	.661	.802	.918	1.017	1.104	1.180	1.250	1.369	1.468	1.620	1.723	1.784	1.811		
3 3/4	1.875	.193	.273	.334	.385	.430	.471	.542	.604	.673	.816	.935	1.036	1.125	1.203	1.275	1.398	1.500	1.658	1.768	1.837	1.871		
3 7/8	1.937	.197	.278	.340	.392	.437	.478	.551	.614	.685	.830	.952	1.054	1.145	1.226	1.299	1.425	1.531	1.695	1.811	1.887	1.928		
4	2.000	.200	.282	.345	.398	.444	.486	.560	.625	.696	.844	.968	1.073	1.166	1.248	1.323	1.452	1.561	1.732	1.854	1.937	1.984		
4 1/4	2.125	.206	.291	.356	.410	.458	.501	.578	.644	.718	.872	1.000	1.109	1.205	1.291	1.369	1.505	1.620	1.803	1.936	2.031	2.092	2.121	
4 1/2	2.250	.212	.299	.366	.422	.472	.516	.595	.663	.740	.898	1.031	1.143	1.244	1.333	1.414	1.556	1.677	1.871	2.016	2.109	2.194	2.236	
4 3/4	2.375	.218	.308	.376	.434	.485	.530	.611	.682	.760	.924	1.061	1.177	1.281	1.373	1.458	1.606	1.732	1.936	2.092	2.208	2.291	2.345	
5	2.500	.223	.316	.386	.445	.497	.544	.627	.700	.781	.949	1.090	1.209	1.317	1.412	1.500	1.654	1.785	2.000	2.165	2.292	2.385	2.450	
5 1/4	2.625	.229	.323	.396	.457	.509	.558	.643	.718	.800	.973	1.118	1.241	1.352	1.450	1.541	1.700	1.837	2.062	2.237	2.372	2.475	2.550	
5 1/2	2.750	.235	.331	.405	.467	.522	.571	.659	.735	.820	.997	1.146	1.272	1.386	1.487	1.581	1.745	1.887	2.120	2.305	2.450	2.562	2.646	
5 3/4	2.875	.240	.339	.414	.478	.534	.584	.674	.752	.839	1.020	1.173	1.300	1.420	1.524	1.619	1.790	1.937	2.179	2.372	2.525	2.646	2.740	
6	3.000	.245	.346	.423	.488	.545	.597	.688	.768	.857	1.043	1.199	1.332	1.452	1.566	1.658	1.833	1.984	2.236	2.437	2.598	2.727	2.828	
6 1/2	3.250	.255	.360	.441	.508	.568	.622	.717	.800	.893	1.087	1.250	1.389	1.515	1.628	1.732	1.916	2.077	2.345	2.562	2.739	2.888	3.000	
7	3.500	.265	.374	.457	.528	.589	.645	.744	.831	.927	1.129	1.299	1.444	1.576	1.694	1.803	1.996	2.165	2.450	2.681	2.872	3.031	3.152	
7 1/2	3.750	.274	.387	.472	.546	.610	.668	.770	.860	.960	1.170	1.347	1.498	1.635	1.757	1.871	2.073	2.250	2.550	2.795	3.000	3.172	3.317	
8	4.000	.283	.399	.489	.564	.631	.690	.796	.889	.992	1.209	1.392	1.549	1.691	1.818	1.936	2.147	2.332	2.646	2.905	3.123	3.307	3.464	
8 1/2	4.250	.292	.412	.504	.582	.650	.712	.821	.916	1.023	1.247	1.436	1.598	1.746	1.877	2.000	2.219	2.411	2.738	3.010	3.240	3.437	3.606	
9	4.500	.300	.424	.519	.599	.669	.732	.845	.943	1.053	1.284	1.479	1.646	1.798	1.934	2.062	2.288	2.487	2.829	3.112	3.354	3.562	3.742	
9 1/2	4.750	.308	.435	.533	.615	.687	.753	.868	.970	1.083	1.320	1.521	1.693	1.850	1.990	2.122	2.355	2.562	2.915	3.211	3.464	3.683	3.872	
10	5.000	.316	.447	.547	.631	.705	.772	.891	.995	1.111	1.355	1.561	1.738	1.900	2.044	2.179	2.421	2.634	3.000	3.307	3.570	3.800	4.000	
11	5.500	.332	.469	.574	.662	.740	.810	.935	1.044	1.166	1.422	1.639	1.826	1.996	2.149	2.291	2.545	2.773	3.162	3.491	3.775	4.023	4.243	
12	6.000	.346	.489	.600	.692	.773	.846	.977	1.091	1.218	1.486	1.714	1.910	2.088	2.248	2.398	2.666	2.905	3.317	3.666	3.969	4.235	4.472	

Standardized Die Parts Release Machines and Skilled Men

By
GEORGE DANNES

Mr. Dannes describes both the design of and the procedure employed in estimating the time required for building a die in which standardized parts are effectively utilized. The manner in which such ready-to-use parts aid in the effort to employ skilled workers more effectively, free certain machines and speed assembly are set forth logically.
—The Editor

Design

THE type of die construction that utilizes standardized, interchangeable parts is being favored more and more in shops where upkeep of the die and continuous production is of the utmost importance.

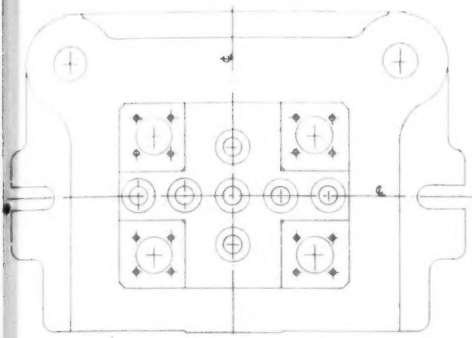
There are several reasons for this—the present scarcity of all around first-class diemakers, men able to build a die from scratch and to see it completely through is probably the most important. The steadily growing pressure on die shops for greater production and speedier delivery has meant that a corresponding amount of specialization in construction has been necessary; so that it is now practically out of the question to make a die or any tool a one man's job. The best use of available man material has been, and is, a major problem in many tool shops.

Another problem, the tie up of available machine equipment, has been growing more serious. Precious hours are wasted by men waiting for others to clear machines, causing costly, unavoidable delays.

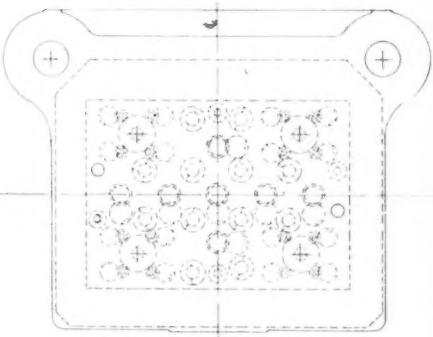
Specialization on certain operations and machines has gradually crept into the shops—offsetting to some extent the shortage of top notch men. By utilizing and training semi-skilled machine operators to produce and supply a large number of the details that go into the average tool or die, the man who is in actual charge of building such a tool or die is relieved of much of the burdensome labor. It is apparent, for example, that a lathe operator will make better time on close limit lathe work than the average diemaker since he has developed a distinct "touch" acquired by years of experience with lathe work. The same is true of the shaper hand, the jig borer operator, the man on the contour saw, filing machine or surface grinder. After their particular ability has been discovered, most men tend to become specialists in their field.

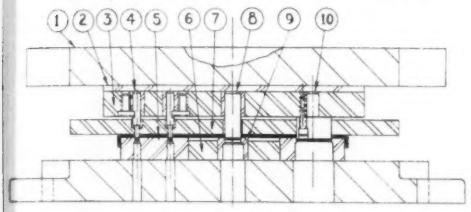
Of course, there will always be a need for the all around diemaker, the master mechanic, who when it comes to splitting thousandths—so essential in precision parts—cannot be replaced by operation

Plan View of Die



Plan View of Punch—Inverted





Section on Center Line of Die Assembly

MATERIAL LIST

Det.	Req.	SIZE & MATERIAL	Remarks
1	1	DIE SHOE	Standard
2	1	⅜" x 8" x 11⅛" BACKING PLATE	Water Hardening
3	1	1" x 8" x 11⅛" RETAINER PLATE	Water Hardening
4	16	B-1 x .196 PUNCH	Standard
5	4	1¼" x 3" x 3" DIE	Oil Hardening
6	1	1" x 8" x 10" DIE BLOCK	Machine Steel
7	1	⅝" x 11" x 14" STRIPPER	Machine Steel
8	7	E-1 x ¾" PUNCH	Standard
9	7	HB x .734 BUTTON DIE	Standard
10	4	1⅝" Dia. x 2¼" CORNER PUNCH	Water Hardening

Pierce Die, showing method of plate mounting with standard parts. Designed by Hovis Screwlock Company, Detroit, Mich.

or machine specialists. However, even the all around diemaker is a specialist —fitting together finished or prefinished details, supervising the tryout and making the adjustments that may still be required to have the die perform exactly right. In other words, he is a specialist in the final stages of the work.

It is clear that whenever satisfactory parts can be purchased outside from a company that itself is a specialist in their manufacture or made in your own shop by a specialist at a fraction of the cost of a skilled tool or diemaker's time, this should be done.

All this applies to the type of die to be described. This die consists largely of standardized, prefabricated details and leaves very little actual time to be consumed in the shop. First there is the die set. Few, if any, shops figure on making such sets if it is at all possible to build a die on a standard set. Then a number of punches, special retainers, standard die buttons, corner die blocks, a machine steel center, die body, stripper, springs and shoulder screws are required.

All punches, retainers, die buttons and special corner sections are contracted by an outside manufacturer. This manufacturer, being a specialist, can do this work more economically at the required accuracy. Our problem resolves itself into the construction of the cross shaped machine steel die center block, the stripper and the assembly of the die.

This die is out of the standard class in that it requires a number of special details. The punch plate or retainer plate, for instance, is of solid construction to hold all the punches. The manufacturer who contracts for the details submits a suitable design for which he assumes responsibility as to tolerances, good engineering principles and the

functioning of the die during its contemplated production life. The punches, or most of them, are of special design. Note also that the four corner punches are of "reversed" design in that their working bodies are larger in diameter than their shanks. This leaves sufficient "beef" in the punch retainer for the four surrounding smaller punches to be held securely in place, as will be noted by an examination of the plan view of the punch holder assembly.

The design is such as to make easy replacement of any one of the four corner punches without loosening or shifting of the center punch, since this latter will always be held securely by at least three screws. All punches, with the exception of the four large diameter corner punches are of the quick release type; even the corner punches can be replaced or examined without removing the stripper by removing three screws for each punch. Since the shank of the corner punches is a slip fit in the retainer plate, removal is an easy matter.

All punches in the cross section are provided with a liner bushing, press fitted into the punch retainer plate, which is made of water hardening tool steel left soft. The backing plate is also made from water hardening tool steel, but hardened. Clearance holes for springs are provided in both plates by the manufacturer of the plates.

There is little or no difficulty in making this die—the diemaker is confronted only with the problem of fitting the four corner sections to the shop-made cross shaped die block in order to have all the punches line up.

Estimate

MACHINING AND GRINDING

Column A—for time values see Table, Fig. 6

	Machining hr.	Grinding hr.
DIE BLOCK—Det. 6—1" x 8" x 10", MS or CR (70%)	1.2	.7
STRIPPER—Det. 7—⅝" x 11" x 14", MS or CR (70%)	1.5	.8

TOTAL Column A ..... 4.2 hrs.

DRILLING ALL HOLES EXCEPT FOR PERFORATORS AND PILOTS

Column B—for time values see Table, Fig. 7

DIE BLOCK—Det. 6—4 screws, 2 dowels ..... .7 hr.
STRIPPER—Det. 7—6 screws .7
DIE SHOE—Det. 1—2 screws, 2 dowels (each corner section) 4 screws, 2 dowels (Det. 6).. 2.3
PUNCH HOLDER—6 screws for STRIPPER—4 screws, 2 dowels for RETAINER PLATE 1.3
12 SPRINGS (Do not confuse with regular spring hole time see Fig. 7) 2.5

TOTAL Column B ..... 7.5 hrs.

LAYOUT AND INSPECTION

Column C—for contour time values see Tables, Figs. 9-12.

Layout

DIE—Det. 5—4 units, see Fig. 9 .4
DIE BUSHINGS—7 holes..... 1.4

Inspection

INSPECTION 9

TOTAL Column C ..... 2.7 hrs.

MACHINING, FINISHING AND FITTING DIE PARTS

Column D—use contour units as established for Column C, also Drawings and Tables, Figs. 13-20.

DIE—Det. 6—4 corner units—9 sq. inches x 1" thick, 2 units each MS or CR (70%)—1.4. 5.6

TOTAL Column D ..... 5.6 hrs.

PERFORATORS, PILOTS AND CORRESPONDING HOLES

Column E—see Table and Drawings, Figs. 21-26.

7 holes in Det. 6, DIE SHOE and STRIPPER, including fitting for buttons 5.6
16 holes below 1" diameter in DIE SHOE and STRIPPER
Clearance holes only—1.6 for STRIPPER 1.7
1.6 for SHOE 1.7
4 holes above 1" diameter in DIE SHOE and STRIPPER
Clearance .8 9

TOTAL Column E ..... 9.9 hrs.

(Continued on Page 34)

The Practical Tool Design and Tool Making Series

Clamps and Clamping Methods for the Tool Room

By E. G. Marshall

Assistant Superintendent
Pittsburgh Screw and Bolt Corp.
Prebble Avenue Plant

Part Two

FIGURE 31 is a drawing of another multiple clamp jig. In this jig one hand knob operates four clamps. To explain the operation of the clamps we will assume the work has been placed in the jig, and that all its component parts have been located in position, and the operator starts to tighten the clamps. We will call the cast body of the jig A. B is the hand knob used to tighten the clamps. As the spring C is weaker than the spring F, the clamp G moves first as the hand knob is turned. The top of G pushes the shaft D against the limit button E. At the same time, the bottom of clamp G pushes the connecting shaft H which moves the bottom of clamp I. Clamp I is pivoted on the pin in the center. As the shaft moves the bottom, the top clamps the hub of the work. Either clamp G or I may move and clamp before the other or they may clamp together, depending upon the friction of the moving parts. After they both clamp, the next yielding part is the spring F. As the hand knob B is tightened still more on shaft J the clamp K is moved. The top clamping the hub of the work and the bottom through the connecting shaft P moves the bottom of clamp M. Clamp M is pivoted on pin O. The pin is a drive fit in the clamp and a bearing fit in the bushing N. The shaft J is slotted to clear it. As the shaft P moves the bottom of the clamp, the top clamps the work. All the work is

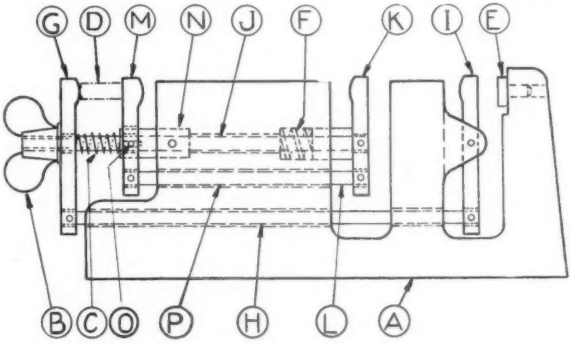


Fig. 31

Clamps and Clamping Methods for the Tool Room

(Continued from Page 33)

clamped and more pressure on the knob tightens all the clamps harder and equally.

Fig. 32 is another type of clamp used as a locator and as a clamp combined. the swinging clamp F. The working face H of the clamps locates the work centrally and forces it against the locating block and holds one end down on the support block. The knob and screw G

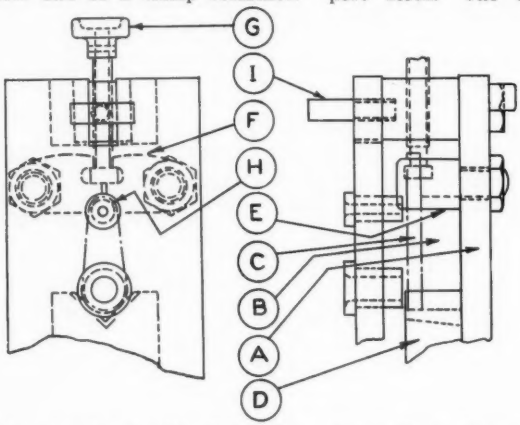


Fig. 32

A is the base made of mild steel. The block B, attached to the base with screws and dowels, serves as a support for the work C. The locating block D has a V-face with an angle to center one end of the work. The angle on the face pulls the work down on the support block. The stud E acts as a pivot for forces these clamps in or opens them up to release the work. This type of clamp is especially desirable where the work varies in size. The locating block centers the large end and locates the hole from the end. The two bushings keep the holes in correct relation to each other.

(Continued on Page 36)

Standardized Parts Speed Die Assembly

(Continued from Page 32)

ASSEMBLY, TRYOUT, DEVELOPMENT	
Column F—see Table, Fig. 28 and accompanying text.	
DIE—Det. 6	1.0
DIE—Det. 5—4 sections, Fig. 28—.5 hrs. each	2.0
BUTTON—Det. 9—7 required (we should allow .1 hr. for assistance since holes are reamed in Det. 6 previously. See "E")	.7
PUNCH RETAINER AND BACKING PLATE ASSEMBLY, including line-up	2.5
STRIPPER—Det. 7	1.0
TRYOUT	1.5
TOTAL Column F	8.7 hrs.
Estimated hours of labor required	38.6 hrs.

This of course is only the actual shop time, and allowance will have to be made for either manufacturer's list prices of standard parts, or if special parts are used as in this case his quoted price will have to be added to the total die cost estimate.

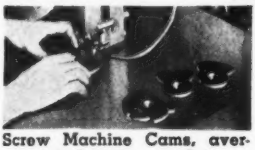
The total estimated time, 38 or 40 hours, represents in this case the period one man will be engaged to complete this one job. Assuming that the parts built outside are on hand, the delivery promise can be based on the availability of a man or men capable of assembling the die.

If all the details would have to be made in the shop by the diemaker himself and for a die of *this substantial construction* with the same layout of expenses and the same man material, many precious hours would be lost and other possible contracts forfeited.

HARD JOBS MADE EASY

ON THE DoAll

C. A. Weidner & Sons, Rochester, N. Y., are now able to do highly specialized metal cutting jobs that would be difficult, tedious and prohibitive in cost without their DoAll Machines.



Screw Machine Cams, averaging ⅜" thick and 8" diam., cut on a DoAll at Remington Rand, Inc., Elmira, N. Y.

Locking Cam and Cam Stop made of oil hardening tool steel cut directly on the DoAll (no die required) by Taylor Instrument Co., Rochester, N. Y.

SPEED UP DEFENSE *WORK*

Time—that's what we're all working against, not only in our defense program, but in regular industrial production. Wherever metal is shaped, cut and used, the DoAll Contour Machine can effect surprisingly large savings in time, labor and material. It's today's indispensable tool.

New—MODEL V-60

A brand new model with three 26" wheels, the third one to give it a throat 60" deep. Handles large size and odd shaped metal parts and products.

Four of these are in use at the Canadian General Electric Co.

New DoAll Grinder with Hydraulic Table Movements

A super precision surface grinder — a real production tool. Less vibration because motor is built right on the ball-bearing spindle. Work table travel is infinitely variable, up to 50 f. p. m., and has exceptionally large bearing surface.

Investigate the DoAll immediately. Let us send a factory trained man to your plant to show you what a DoAll can do for you.

FREE—Ask for Literature on all DoAll Machines or 158-page Handbook on Contour Machining.

CONTINENTAL MACHINES, INC.
1303 S. Washington Ave., Minneapolis, Minn.

Clamps and Clamping Methods for the Tool Room

(Continued from Page 34)

Thus the variation is on the small end beyond the small hole where it makes no difference.

As a final example of a clamp mechanism, an air operated clamp, Fig. 33, is selected. This type of clamp is especially desirable for quick clamping and regulation of clamping pressure. A pressure regulating valve in the air line permits the clamping pressure to be adjusted at will. On jobs where the operator has to drill large quantities and drill them quickly, this clamp is a time saver. In clamping thin parts that might spring the diameter of the cylinder, the air pressure can be changed to lower the clamping pressure. In Fig. 33, (1) is the body of the jig. Number 2 is the locating block to support and locate the work. After the work has been placed in position, the operator moves the handle (3) to operate the air valve. Section A-A represents a cross section of this valve. The air enters at coupling (4) and passes through the valve into the top of the cylinder above the cup leather (5). The air pressure moves the plunger (6) down, the bottom end contacting the clamp (7). The clamp is pinned to a link (8), which allows the top of the clamp to swing out to clear the work and yet move down to clamp in a straight line. This link is pivoted on a pin (9) in the block (10), which is screwed to the base. While the air valve is operated by one hand, the other hand pushes the clamp in against the locating block (11) causing the button (13) to clamp the work in the correct spot. When the air is released, the springs (14) raise the clamp, exhausting the air in the cylinder, and the spring (12) swings the clamp out to clear the work for unloading and loading.

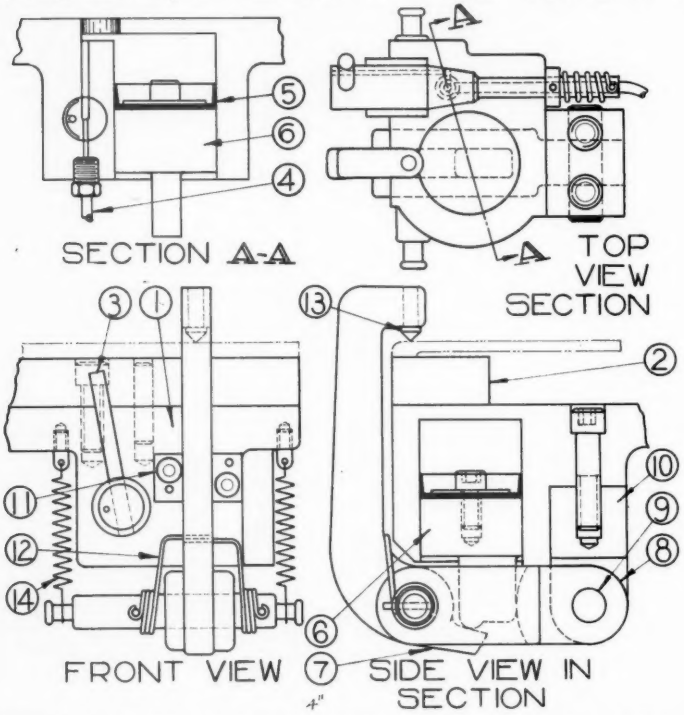


Fig. 33

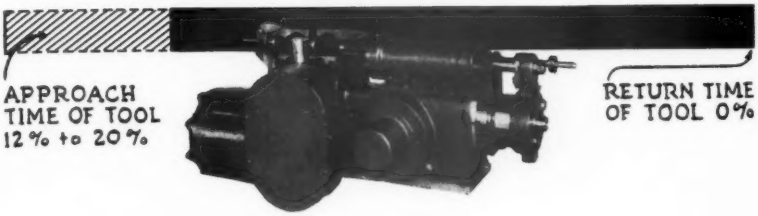
Use this EMPCO UNIT

(produced under Millholland patents)

and keep your tools

ACTUALLY PRODUCING

80% to 88% of working time



Empco Units can form the fastest production machines for rotary tool operations, and they lend themselves to a wide diversity of adaptations. This greater production is made possible through the specially designed cam which utilizes the pneumatic counterbalance to best advantage. Cutting time is measurably increased and idle time is reduced to a minimum. Empco Units produce any given number of pieces in less time. Light or heavy work.

The use of plate type cams, simple feed, and speed gears, and the interchangeability of parts and same size units, permits change-over with minimum cost.

Empco Units are adaptable for drilling, reaming, tapping, broaching, spotfacing and milling (either singly or in multiples or groups). Full automatic cycle with interlocked controls permits exceptional extensions of groups of units.

Write for illustrated descriptive folder.

EMPCO

ENTERPRISE
MACHINE PARTS CORPORATION
2735 JEROME AVENUE • DETROIT, MICHIGAN

INSISTENT DEMAND *brings volume Production*

The Cleveland No. 1 Vertical Milling Machine, designed and built particularly for the exacting requirements of present day tool room, die and mold shop practice and the heavy duty of continuous precision manufacturing, is now in quantity production to meet the demands of our Defense Program.

Over 20 years of experience in machine design and building backs up the performance of the new Cleveland.

SPECIFICATIONS

- **Capacity:** Longitudinal feed, 18" Cross feed, 8" Vertical feed, 16"
- **Table:** Working surface, 8" x 32" T-Slots, Three, 17/32" Power by 1/3 hp motor
- **Table Feed:** Twelve feeds with range from .6" to 12½" per minute.
- **Spindle:** Chrome nickel steel, heat treated and ground. Taper No. 30 (new National Standard) Mounted on Pre-Loaded Precision Ball Bearings.
- **Spindle Speeds:** Twelve, with range from 100 to 1850 r.p.m. Power from 1½ hp motor, flange mounted and adjustable with hand wheel to shift "V" belt for quick change of spindle speeds.
- **Feed Screws:** Mounted on Timken bearings; are provided with dials graduated in thousandths of an inch.
- **Feed Gears:** Chrome nickel steel; mounted on Timken bearings.
- **Floor Space:** 36" x 42" front to back x 87" high.
- **Cutter Capacity:** 1/16" to 2½" mills.
- **Also High Speed Operation:** Design and construction of the Cleveland No. 1 Miller permit 8 operating speed changes ranging from 900 to 6000 r.p.m. when equipped with 2-speed motor with speeds of 1800 to 3600 r.p.m.

Stop at Booth No. 395 at the A.S.T.E. Show and see the Cleveland in operation

THE SOMMER & ADAMS CO.

18511 EUCLID AVENUE CLEVELAND, OHIO

PLASTIC MOLD DESIGNING

By GORDON B. THAYER
Plastics Design Engineer
General Industries Company

Article XIII of a Series

Mold Building Equipment and Machinery

PROPER mold design calls for thorough familiarity with practical tool room methods and equipment. One mold design may be as good as another from a functional standpoint, but convenience in fabrication is another story. Since the methods employed in building a mold for a given product will vary from shop to shop according to the equipment and men available, there is no way to set up standard methods of design. However, some general principles may be mentioned concerning the various pieces of equipment used in building molds.

While the methods of mold sinking were outlined in a preceding chapter, stress was not placed upon the operation of machines employed to obtain the desired effect. Metal cutting, for instance, may be done in a lathe, a milling machine, a duplicator, or a drill press. A milling machine, however, is much more convenient for machining a mold cavity than is a drill press. This is a rather obvious example of one choice between alternate methods.

A few specialized machines have been developed to supplement the general purpose machine tools for use in mold building. Precision is a desirable quality, but the jig borer in an air-conditioned room is not usually required in plastics mold work. The standard tool room machines, balanced numerically for all around work, are suitable for mold building, except that not as many surface grinders may be required as are required for stamping die work.

The machinery used in building plastics molds may be divided into three classifications: general purpose tools, special tools and auxiliary equipment. General purpose tools include lathes, milling machines, shapers, planers, drill presses, band saws and grinders. Special tools include duplicators, hobbing equipment and polishing machinery. There are many useful auxiliary tools, such as filing machines, hand grinders, tool grinders, hand tappers, laps, hand files, abrasive stones of various grain and shape, and many others available in the tool room for precision work.

General Purpose Tools

Internal and external spherical and irregular contours for round molded parts are machined in lathes. Special form cutters are used both in the tool holder and in the tail stock. Many external and internal cylindrical grinding jobs are set up in a face plate or in a four-jaw chuck when one portion of the

(Continued on Page 42)

SEE OUR DISPLAY

Booth 360

Atlas
LATHES
The Economical Solution to Many a Shop and Tool Room Problem
"Speed up! . . . speed up!" Atlas helps meet those demands with lathes for small operations — permitting larger machines to work steadily on the big jobs. Check these modern Atlas features against your production needs:
Power Cross Feed standard equipment.
Precision Ground Bed.
Custom-Built Spindle Bearings.
Backgeared Power — Complete V-belt Drive — Wide Screw-Cutting Range — Quick-Change Countershafts — Rugged Zamak Alloy Parts — at no extra cost.
Atlas F-Series 10" Lathes, less motor, are $112 for horizontal countershaft (36" bed), $107 for vertical. Atlas 6" Lathes as low as $66.50 less motor. Send for the 1941 Atlas catalog for complete details.
ATLAS PRESS COMPANY
312 N. Pitcher St., Kalamazoo, Mich.
NEW YORK 130 W. 42nd St.
CHICAGO 35 E. Wacker at Wabash
PHILADELPHIA 113 N. Third St.
OTHER TIMELY Atlas MACHINES
7" SHAPER
Handles with speed and precision everything from ½" to 7" stroke
Crank-type bull-gear drive, 4 speeds, 5 automatic cross feeds, complete V-belt drive. Operates from ½ HP motor. Price $265 less motor.
MULTIPLE SPINDLE DRILLING MACHINES
Speed up work on drilling and tapping up to ½". 2, 3, and 4 spindles — $195, $310, $350 less motors (1/3 or 1/2 HP).
QUALITY SHOP EQUIPMENT SINCE 1911

Mold Building Equipment and Machinery

(Continued from Page 40)

force or cavity is eccentric, and can not very well be centered in the regular cylindrical grinding machines. In such operations, efficient grinding is done by high speed electric or air grinders held in the tool slide. When a large number of cavity blocks is to be turned, it is good practice to make up sets of two or more rough and finish form cutters to be used in the turret lathe. Thread plugs for molding internal or external threads are usually chased. Sometimes one lathe in a tool room is fitted with special gears to compensate the thread lead for shrinkage of the molded part. Some designers question the advantage of this, but for precision molded parts which must fit mating metal parts, the use of compensating gears is advisable.

Knockout and Molding Pins

Knockout and molding pins are turned and faced to length in high speed bench lathes. After the pin heads are upset and faced true, the turning operation is done. Bearings and tool slides must be in good condition as the pins are slender and extreme rigidity is required. For long pins, a steady rest must be used to support the work. The designer should keep the pins in a mold as large in diameter as possible and as short as practicable. Pins should be turned close to the finished size before hardening, since polishing away the excess metal is very likely to throw them out of round.

When mold sinking is done on milling machines, universal mills with vertical milling attachments are very serviceable and flexible. Such units are made for the high speeds required when using small diameter cutters. Angular cuts on cores, forces and cavities are conveniently made with the vertical attachment which is easily adjusted. In combination with a rotary table, the vertical head may be used for accurately locating centers and swinging arcs. A vertical head may be used on a number of different sizes of universal mills, and thus makes possible the use of the smallest machine which will take the work. It is a real convenience to the tool maker not to have to walk around an unnecessarily large machine. Small vertical mills built especially for high speed milling have inherent rigidity, a necessity for precision milling on hardened mold parts which must be repaired quickly and are not annealed for this reason or because of fear of distortion. Milling is a very convenient method for machining hobs and forces; these should be designed with a shoulder at the back end for clamping to the table.

Cavity and force blanks are usually rough machined to size in a shaper, although it is convenient to use a planer for large forgings. Shaping and planing cutter action is not adapted very well for cavity sinking, but rectangular forces usually requiring considerable metal removal can be economically machined by this means. Clamping slots in steam plates and mold shoes are usually planed if a planer is available, but the slot must be machined so the lip which engages the clamp is square and true, in order not to allow the clamp to slip off.

Holes in forces and cavity blocks for molding and knockout pins must be round and straight. They are usually drilled in a sensitive drill press, with a good bed plate. The holes are lapped after hardening and, as with pins, not too much lapping allowance should be made, or egg-shaped holes will result. Steam lines can be drilled in any drill large enough to hold the work, but it is very convenient to drill them in a radial drill, as the steam plate can be clamped on edge and left in one position while the drilling head is moved from one hole to the next.

Steam, Other Backing Plates

Steam plates and other backing plates and adaptor plates are ground flat and parallel on large vertical spindle surface grinders. Here there is usually not much attention paid to thickness except to clean up the plate and make it flat and true. Molding and knockout pins which must pass through such plates are cut to length after the plates are ground.

The back surfaces of finished force and cavity blocks are ground to final finished height after being hardened and polished. This is usually done on small horizontal spindle surface grinders. When a number of cavities are to

(Continued on Page 88)

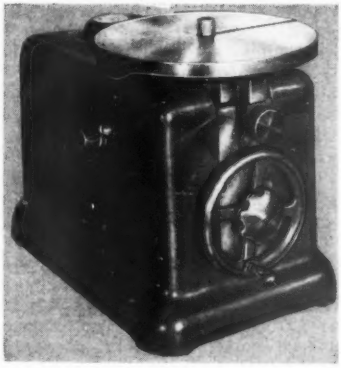
Tools That Meet The Increasing Demands On The Tool Room

Boyar-Schultz Profile Grinders are playing an important part in keeping ahead of the insistent demand for greater production effort.

BOYAR-SCHULTZ PROFILE GRINDER No. 2 is designed for grinding curved and irregular surfaces, profiles and contours.

Equipped with 2 oscillating spindles — both operating at high speed of 10,000 R. P. M.— it is a tool for handling the most complicated contour grinding jobs.

Write for New Circular Describing These Tools



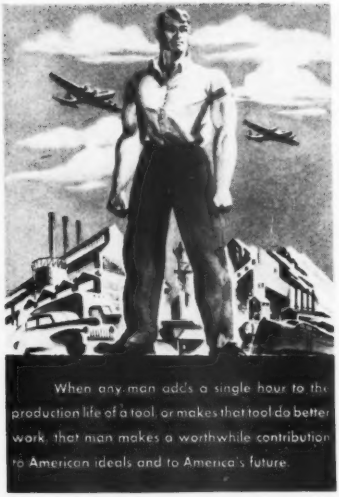
Boyar-Schultz Profile Grinder No. 1 is a Bench Model occupying space 10½" x 16½". Its high speed oscillating spindle operated at 20,000 R. P. M. makes it possible to do efficient contour grinding with small diameter wheels.

It is a precision tool—a time-saver —not only in the tool room, but also in production, where set-up time is a factor.

See Boyar-Schultz Profile Grinders Demonstrated at the A. S. T. E. Show in Detroit.

BOYAR-SCHULTZ CORPORATION

2112 Walnut Street **Chicago, Illinois**


When any man adds a single hour to the
production life of a tool, or makes that tool do better
work, that man makes a worthwhile contribution
to American ideals and to America's future.

More Careful Handling of Small Tools is Imperative

By Charles J. Koebel
President
Koebel Diamond Tool Company

THIS wealthy nation of ours is looked upon by other countries as a spendthrift. Everything we do is on a generous scale, including what we waste. It is said that an average family in most of the other nations could be fed satisfactorily on the waste from the kitchen of many an ordinary American home.

Everyone is aware of the serious shortage of SKILLED mechanics. It is estimated by reliable sources that we could use—right now—almost a million more trained machine operators than are available. Industry is straining every nerve to meet National Defense schedules. Our factories are packed with men, reaching new employment peaks, but too frequently it seems necessary to put men, whose training and experience are wholly inadequate, at operating expensive machines.

Perhaps, then, we are only running true to form when in this Defense emergency we find ourselves spoiling valuable small tools as never before. Here the waste goes farther than the tools themselves to include lost time of men and machines and spoiled work.

If there ever was a need, as some persons seem to think, to stimulate business by not being too thrifty, that time has passed. The trend must be in the direction of making tools and machines do more and this is particularly true of those items for which the demand is already far beyond our ability to manufacture. Small tools of many kinds are in this category.

Perhaps America of tomorrow cannot afford such wastes, and there should be an attempt to check this rising small tool spoilage right now. It would be a good start because when any man adds a single hour to the production life of a tool, or makes that tool do better work, that man makes a worthwhile contribution to American ideals and to America's future.

I believe that every man—whether he admits it or not—takes pride in doing his work well. Within him is the desire to *give* to the fullest extent of his ability and training.

Because this trait is universal, a dual responsibility is placed on Management: (1) To furnish men with suitable tools, and (2) to teach them the proper use of these tools.

Mr. Koebel's conviction in respect to his expressed opinion is so firm that his company has prepared an 11" x 17" cardboard poster of the workman as illustrated, suitable for shop and tool crib display. It has no advertising and will be mailed upon request along with a 28-page booklet written particularly for the workers who want to know more about "small tool use and care." We recommend it without reservation. EDITOR.

We Change Our Name

GEORGE J. HUEBNER, Publisher.

IF we who have been publishing Tool-Die-Machine PROGRESS each month could have especially ordered a series of events to herald the change of name of our publication, we hardly could have set the stage more effectively.

First, the establishment of the National Defense Program brings the full realization that production in every industry must be preceded by the design and construction of tooling. Tools are the most fundamental of industrial products. Without them, most of industry's manufactured products remain practically hand-made and correspondingly costly; with them, mass production achieves economies of manufacture which in turn establish costs so low that volume buying results.

Even the new model of a machine tool, designated The Master Tool of Industry, has to be "tooled up" before its manufacture begins. And when it takes its place in a production or tool room, it requires a tool, saw, file or abrasive wheel to achieve its purpose. In many installations additional *special tooling* in the form of jigs, fixtures, gages and similar tooling accessories are also required. Stamping presses and die casting machines function only as they are equipped with dies; plastics molding machines with molds. Thus is the fundamental character of *tooling* established.

The design, construction and care of *tooling* are the highly individualized activities of thousands of skilled men in tool rooms die and mold departments, in cutting tool manufacturing plants and in the Contract tool and Die shops of the Nation. Irrespective of their type or the industry in which they are used, as they fall into the broad classification of *precision tooling*, descriptions of them are of interest to our readers.

One of our advertisers influenced us greatly in our decision to change our name. He said:

"You cover the *tooling* field thoroughly and you are the only trade

(Continued on Page 51)

Get Better Response with Ryerson VD Steel

Better Dies, Punches, Chisels . . . . Easier Machining . . . . . Easier to Harden . . . . . Less Expensive

Ryerson VD Steel solves a threefold production problem in tool-making . . . quality steel; ease of machining; low cost. Splendid water-hardening results are always assured, because VD Steel offers the widest range of hardening temperatures for any steel in its group. Many successful shops find it profitable to standardize on Ryerson VD Steel as their only water-hardening steel. Its treatment is so simple that experience gained from heat treatment can serve in all future applications. Learn more about this low cost VD Steel today by sending for a descriptive bulletin telling of this remarkable steel.

Send the coupon, or write Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Boston, Buffalo, Philadelphia, Jersey City.

Ryerson stocks include:

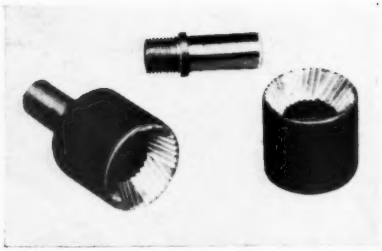
Structurals
Bars
Plates
Sheets
Alloys
Tool Steel
Shafting
Tubing
Stainless
Welding Rod
Nuts, Bolts
Rivets, etc.

Name ..... Position .....
Company ..... Street .....
City ..... State .....
Tear out, Mail Today!

Severance Offers New Deburring Cutter

AN Outside Deburring Cutter for deburring ends of rods and tubing is the latest addition to the growing line of Severance Standard Tools. The favorable reception accorded the Combination Inside and Outside Tube Burring Cutters, exclusively designed and manufactured by the Severance Tool Mfg. Co., has persuaded the company to add the Outside Deburring Cutter, formerly supplied on special order, to its regular line.

The new Outside Deburring Cutter, of interest to all makers and manufacturing users of rods, shafts, splines and



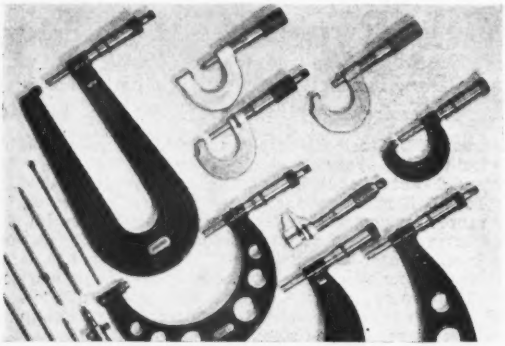
tubing, has proven very satisfactory for the removal of rough edges or burrs by producing a slight chamfer and in the removal of flash or slight irregularities from the edges of bosses, collars, bushings, etc., of cast, forged or molded parts.

This new Severance Cutting Tool has a standard mouth angle —30 or 45 degrees in stock design—and other mouth angles to special order. Each size cutter covers rod diameters within the range of its mouth angle, i.e., diameters between the recess or "hole" diameter and the mouth or "rod" diameter. The remarkable chamfer cutting action of the new Outside Deburring Cutter is due to the Severance tooth design which produces a shearing cut that forces the chips out or away from the tool, thus preventing loading.

Severance Bulletin No. 12-0, giving dimensional drawings and sizes of the new cutter and threaded shank, list prices and discounts, is now available for distribution.

For your copy of Severance Bulletin No. 12-0 on the new Outside Deburring Cutters, write Severance Tool Mfg. Co., 1506 E. Genesee Ave., Saginaw, Mich.

Visit STARRETT Booth No. 157—A.S.T.E. Show



STARRETT MICROMETERS

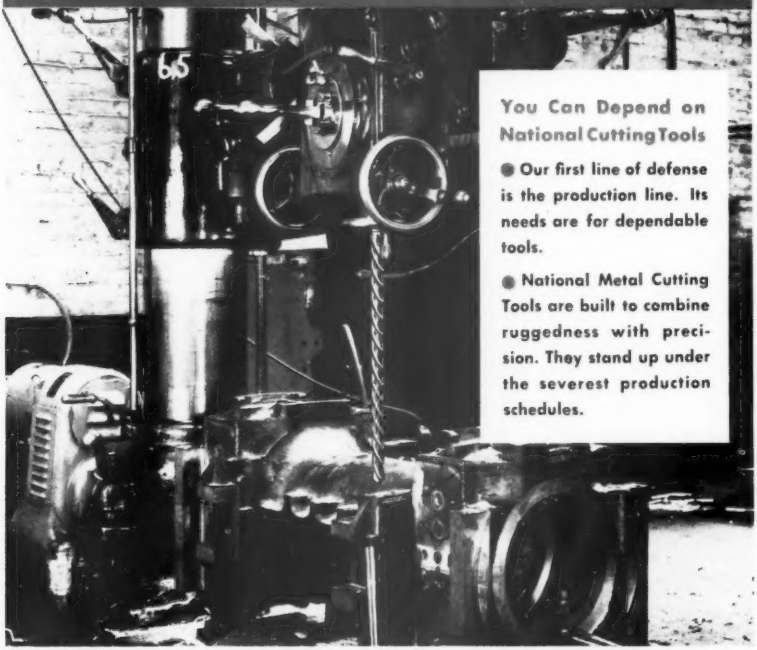
Starrett makes Micrometers in over 300 different types and sizes. For better, faster work, pick the right Micrometer for every job from the complete Starrett line. See them at your tool dealer's or write for Starrett Catalog No. 26-DM.

THE L. S. STARRETT CO.
WORLD'S GREATEST TOOLMAKERS
Precision Tools...Dial Indicators...Ground Flat Stock
Hacksaws...Metal Cutting Bandsaws...Steel Tapes
ATHOL, MASSACHUSETTS, U. S. A.

Standardize on
STARRETT TOOLS
BUY THROUGH YOUR DISTRIBUTOR

NATIONAL
Metal Cutting Tools

To Meet Today's Schedules—Tools Can't Be *"BABIED"*!



You Can Depend on National Cutting Tools

- Our first line of defense is the production line. Its needs are for dependable tools.
- National Metal Cutting Tools are built to combine ruggedness with precision. They stand up under the severest production schedules.

NATIONAL

NATIONAL TWIST DRILL & TOOL DETROIT U.S.A.

TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS

TWIST DRILL AND TOOL COMPANY

Home Office and Factory — DETROIT, U. S. A.

Factory Branches • New York • Chicago • Philadelphia • Cleveland • Distributors in Principal Cities

The Drive-All UNIT

MOTORIZING

NOW available

-CLUTCH CONTROL optional on all models

Clutch is operated by a turn of lever

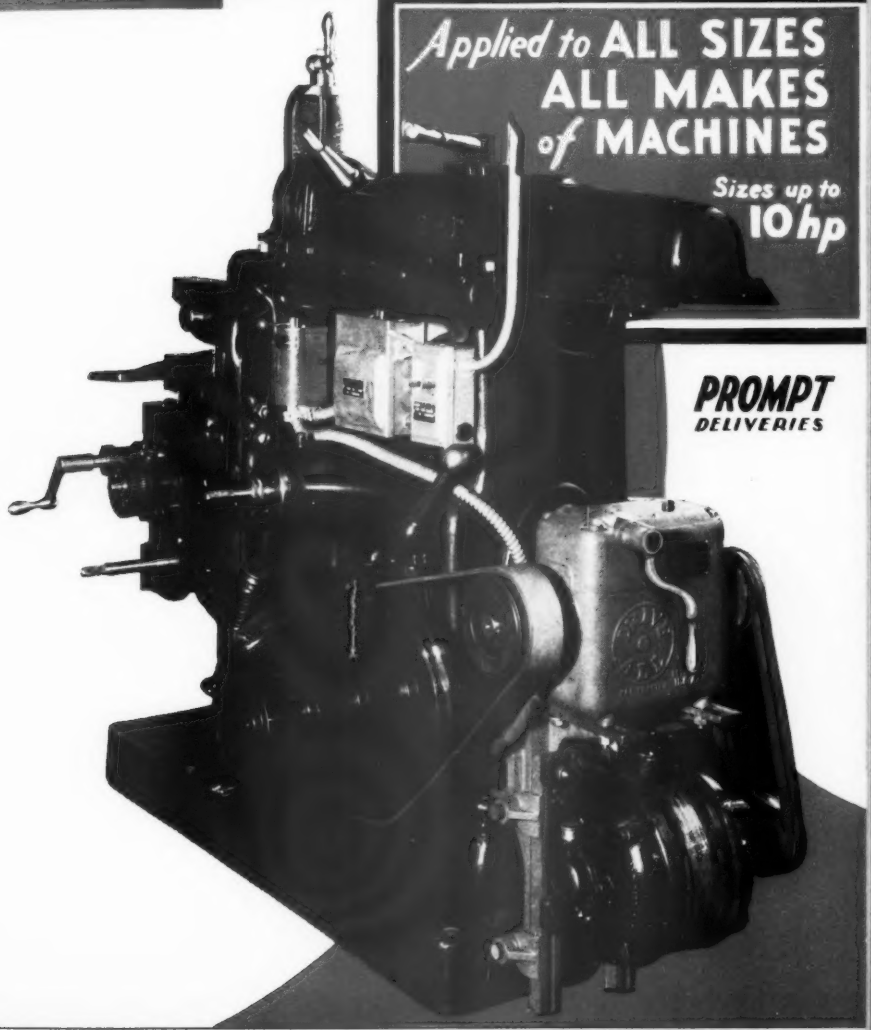
Adjusted to any position

DRIVE-ALL MANUFACT

STEPS-UP PRODUCTION

Applied to ALL SIZES
ALL MAKES
of MACHINES

Sizes up to
10 *hp*



PROMPT
DELIVERIES

TURING Co., DETROIT-MICHIGAN
3400 Conner Avenue

The "first word" of Midget Milling Cutters was shaped and spoken by Mr. R. M. Severance in 1931 . . . . And the "latest word" in Midget Cutters has been lettered and spelled by the Severance Tool Company every month and year since that time . . . . But the so-called "last word" in Rotary Power Cutters will never be uttered by the Severance Company; BECAUSE the word "severance" means change—division or separation—and as applied to cutting tools "Severance" also means progress—definite savings—speed—accuracy—the introduction of regrinding at low cost—less labor and greater satisfaction for every user.

All that can be worthily said, in view of all that this new Tool Cutting Service is doing for the Metal, Wood, and Plastic Industries, is paragraphed in recent expansions of the Severance Organization, including a new factory—new designs—a new personnel; and in the longer life and faster clean-cut performances of hundreds of thousands of New Cutters that have been shipped by Severance to all parts of the United States and to many other countries.

Let "your first word" be a request for information or engineering service, so "Severance" may help solve your problem.

SEVERANCE TOOL COMPANY
Saginaw, Michigan
Main Offices at 1506 East Genesee Avenue

MIDGET MILLING CUTTERS
"Ground from the Solid After Hardening"

Defense Program Notes

Prime Contractor List

A list of all companies who have accepted one or more contracts of $100,000.00 or more for production of equipment, components or machines for National Defense has been prepared by the Advisory Commission of the Council of National Defense, Federal Bldg., Washington, D. C. The list has been designed for use by prospective sub-contractors, particularly those equipped to make ammunition components, aircraft parts, machines and precision parts. A copy of the list will be sent to shops on request.

"Labor Speeds Defense"

This 40-page booklet, published by the Labor Division, National Defense Advisory Commission, is the report of progress made in employer-employee relations, training for defense workers, including "on-the-job" training, and the plan of "farming-out" defense orders. An appendix contains two tables of strike statistics and complete text of the labor policy adopted unanimously by the National Defense Advisory Commission.

"Fundamental Economic Issues in National Defense"

This booklet, issued by The Bookings Institution as Pamphlet No. 26 states and gives answers to four of the most important economic questions arising from our National Program — economic readjustments required; effect of cost on public debt and credit; possibility of commodity price inflation; and the danger of post-war collapse.

We Change Our Name

(Continued from Page 45)

paper of its kind, so why not just make it 'Tools and Dies'? That's short, easy to remember, and certainly descriptive of your field."

Therefore, beginning with the March issue, Tool-Die-Machine PROGRESS becomes The TOOL and DIE Journal. In commendation thereof our advertisers are making it possible for this to be our largest and most interesting number, for which we are duly grateful. We hope that our readers will approve our new name.

★ ★ ★ When any man adds a single hour to the production life of a tool, or makes that tool do better work, that man makes a worth-while contribution to American ideals and to America's future.

Every man — whether he admits it or not — takes pride in doing his work well. Within him is the desire to *give* to the fullest extent of his ability and training.

Because this trait is universal, a dual responsibility is placed on Management: (1) to furnish men with suitable tools, and (2) to teach them the proper use of these tools.

Responsibility for the training of men in the use of tools must begin with those who make the tools.

KOEBEL DIAMOND TOOL CO.

Diamonds for All Industrial Purposes—Koebelite Diamond Tools

9350 GRINNELL DETROIT, MICHIGAN

Write for booklet "For (Grinder) Men Only". It will help prolong the life of your diamond tools.

Davis Tool and Engineering Moves Into New Plant

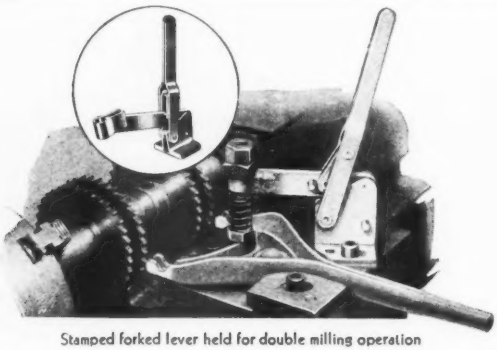
Charles W. Davis, secretary, Davis Tool & Engineering Company, announces the removal of the company to their new plant at 19250 Plymouth Rd., Detroit. The new plant, with a 200-foot frontage, is in two units—the Tool Shop occupies approximately 20,000 square feet of floor space, the Stamping Plant an area of 8,000 square feet. Between the shops, and all in a single modern structure, are the offices and service departments, including tool crib, engineering room, welding room and heating plant.

Facilities for tool work and stamping operations have been increased considerably. The plants of the company, formerly scattered, are brought together with a definite gain in operating efficiency. New equipment to increase production even more has been installed and been placed on order.

Oliver Introduces Ace Tool and Cutter Grinder

An unusually well illustrated folder describing the Ace Cutter Grinding Machine made by Oliver Instrument Company. On this machine, the principle of grinding is reversed from the usual type of cutter grinding in that the work is held stationary and the grinding wheel traverses the edge of the cutter. The grinding wheel has a stroke of 10", is traversed by means of rack and gear which, in turn, are actuated by a lever adjustable to the position of the operator. Clearance angles are obtained by tilting the grinding wheel the desired amount as indicated on a scale graduated in degrees. Design of the machine makes only a small number of fixtures necessary, lessens the time required for adjustment to the various types of cutters. The circular describes and illustrates the simple processes of grinding a spiral taper reamer; a hob; spotfacers, counterbores and end mills; both top face and back angle of a double angle cutter; a face mill, and a staggered-tooth cutter. Comparatively simple attachments are available for correctly grinding taps, broaches and for point thinning of drills.

For specifications and prices of the Ace Tool and Cutter Grinder, write Oliver Instrument Co., Adrian, Mich., for Circular TD.



Stamped forked lever held for double milling operation

for Low Cost Production
Use **DE-STA-CO Toggle Clamps**

In every operation where parts must be held in fixtures for drilling, milling, welding, assembly and the like, the production *rate* depends upon positive clamping—and instant release . . . And production *costs* likewise.

De-Sta-Co quick-acting Toggle Clamps are nationally recognized as the efficient, low-cost method of designing and carrying out production . . . Write now for Bulletin No. 40, showing types and sizes best fitted to your requirements.

DETROIT STAMPING CO.
Established Over 25 Years
344 Midland Ave • Detroit, Mich.

Light is Cheap—Poor Work is Expensive

Most precision work is much better done when lighting is localized. A worker is no better than his ability to see what he is doing, and there is no longer any doubt but that improper lighting or a poor quality of illumination slows production. Good industrial lighting is a combination of general lighting for the background and localized lighting for the close-up. Such direct lighting can now be fitted to the requirements of the machine or the job. Fostoria Localites' catalog entitled "Lighting for Seeing *on* the Job" describes every type of machine, bench and table model for use in engineering departments, in tool rooms, die shops or production and inspection lines, and in fact wherever better seeing will bring greater efficiency.

Write the Fostoria Pressed Steel Corporation, Fostoria, Ohio, for Catalog ML-25.

American Issues New Swiss Pattern File Catalog

Swiss Pattern Files are particularly valuable for the precision work which is required in tool rooms, die and mold shops and in the manufacture of parts which must be finished within close limits. A new catalog which lists, illustrates and describes more than 3,000 different shapes, cuts and sizes has just been issued by the American Swiss File and Tool Company, whose experience covers a period of 40 years.

These Swiss Pattern Files are double cut from tang to extreme point and have a larger filing surface than most similar files made in the United States. They are made of *highest* grade *file* steel, not tool steel and from *25 to 30* operations are required in their manufacture. Tolerances for some shapes have to hold to ± .002 of an inch while uniform hardness is assured by heat treatment held automatically to within ± 5° F.

Among the numerous file groups developed especially for precision workers are those for die makers, die sinkers and glass mold makers; fine gage and instrument makers. These sets include riffflers of almost all conceivable shapes and combinations, some carried in stock by dealers, others made up on order only.

For a copy of this authoritative catalog write American Swiss File and Tool Co., 414 Trumbull Ave., Elizabeth, N. J.

INTOLERANCE IS *sometimes* A VIRTUE...

specify

JESSOP TRUFORM

Non-Shrinkable TOOL STEEL

When making Precision Tools and Dies

CELEBRATING OUR 40TH. ANNIVERSARY 1901 1941

America has grown great because we have been tolerant in the matters of politics, religion, and race . . . *intolerant* in our standards of quality and accuracy for factory made products.

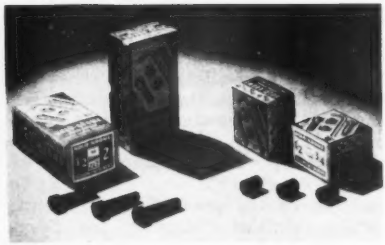
JESSOP "TRUFORM" is an oil hardening alloy steel developed for use in dies, tools, gauges, and other applications where close tolerances must be maintained. Its high resistance to distortion enables it to be used safely by inexperienced tool and die makers as well as by veterans of the industry. Write today for your free copy of our 6-page folder which fully describes JESSOP "TRUFORM" Non-Shrinkable Tool Steel.

JESSOP STEEL COMPANY
610 Green Street Washington, Pa.

JESSOP STEEL CO. WASHINGTON PA. FINE JESSOP STEELS

Jessop Steels of America

CARBON- HIGH SPEED- SPECIAL ALLOY- STAINLESS- and COMPOSITE STEELS



New Design Box Container for Holo-Krome Screws

THE Holo-Krome Screw Corporation of Hartford, Conn., manufacturers of FIBRO FORGED Socket Screws, announce a new "overall" design for all Holo-Krome boxes which illustrates in an attractive manner the various products of the company and features conspicuously the trade-mark name "FIBRO FORGED Screws". The new container is the work of John Vann, who has created many unique industrial designs.

The new boxes are printed in a pleasing green on strong, tough, brown fibreboard box stock. The identifying label, giving style, size, thread, etc., is a component part of the new box design.

Black Announces New Hardsteel Drills

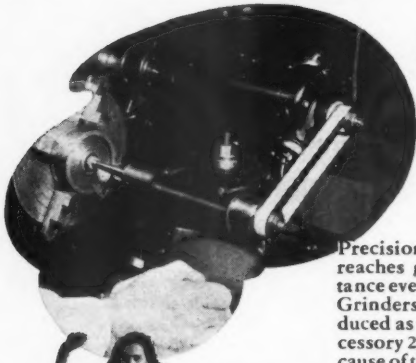
THE development and manufacture of Hardsteel Drills is announced by the Black Drill Company. These drills are designed for work which ordinary drills cannot do. The manufacturer claims that these tools will drill screw and dowel holes in hardened die sections without removal from die shoe; drill hardened production parts, often salvaging what might have become scrap because of an engineering change; drill into both hardened boring bars and tempered spring steel.

All of this is accomplished without annealing any portion of the hardened steel piece. Counterboring and countersinking as well as tapping are accomplished with equal ease. The drills may be sharpened effectively by hand, no fixtures being necessary.

"Hardsteel Drills may be used in any machine on hardened parts where ordinary drills are used before hardening parts."

Die Supply Co., 1390 E. 30th St., Cleveland, O., are distributors. Write for circular and prices.

Accuracy in Action!



Scully-Jones and Company, Chicago, well-known manufacturers of tools, call upon the versatile Dumore No. 5 to provide .0001" accuracy on an exacting production job.

The New Departure Div. of General Motors has helped revive bicycling with better bearings and brakes. Dumore Grinders are widely used in their plants.

Precision grinding reaches greater importance every day. Dumore Grinders were introduced as a tool room accessory 25 years ago. Because of their versatility, they are now used in production lines to improve products while reducing labor, overhead and spoilage. Your Dumore distributor will give full facts . . .

THE DUMORE CO., Dept. 371-C RACINE, WIS.

Dumore PRECISION Grinders

A Formula for Straight Line Milling

(Continued from Page 26)

$$N=\frac{12\ S}{\pi D}=\frac{38.2\ S}{D}\qquad T=\frac{L+X+e}{F\ N}=\frac{L+X+e}{H}\qquad H=\frac{L+X+e}{T}$$

A Formula for Straight Line Milling and Quick Return

Use same letter designations as in preceding formula, and the following:

J= reversing time at end of milling cut (.020" to .060" depending upon machine size)

K= length of return movement, in inches

P= feed rate of quick return, in inches per minute

Q= quick return time, in minutes

U= length of fast feed to cut movement, in inches

V= time for fast feed to cut, in minutes

W= loading and unloading time, in minutes

A= No. of pieces per load

Z = time for milling one piece

$$K=L+X+e$$

$$V=\frac{U}{P}\qquad P=\frac{U}{V}\qquad U=PV$$

$$Q=\frac{K}{P}\qquad P=\frac{K}{Q}\qquad K=PQ$$

$$Z=\frac{V+T+J+Q+W}{A}$$

Editor's Note: This data was published by special request of a shop executive who after he had seen this and several other sections of the material stated that, in his opinion, the shops now busy on production work would find the Table of Relative Values of particular interest. Following our established custom we will publish technical and practical shop information of most direct interest and value to our readers.

MILLIONTHS-INCH TOLERANCES

Achieved with Johansson Gage Blocks

Johansson Gage Blocks are the world's highest standard of precision measurement. They measure accurately in millionths of an inch — an accomplishment considered impossible before their introduction.

A full set consists of 81 blocks, which combine to form 120,000 different size gages, in steps of .0001 inch, from minimum size .200 inch to more than 12 inches. Accurate to within ± .000008 inch, ±.000004 inch. Johansson Gage Blocks establish precision without parallel for widely varied craftsmanship.

FORD MOTOR COMPANY

Johansson Division, Dearborn, Mich.

The files that last longer

This is the report of users of "American Swiss" Swiss-Pattern Files who have compared these precision files to others.

The reasons . . . . specially high grade metal (file steel, not tool steel), accurately controlled and uniform hardening, deep sharp cutting edges, and more filing surface than in most Swiss-pattern files made in U. S. A.

Over 3000 different shapes, cuts and sizes provide the right selection for every precision or intricate filing job.

Buy from our Distributor.

American Swiss File & Tool Co.

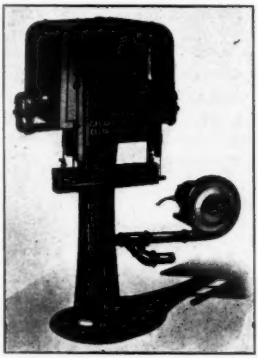
Elizabeth **New Jersey**

AMERICAN SWISS

FILES OF PRECISION

New Tool Room Furnace Heats 25 Per Cent Faster

A temperature of 2300° F. in 22 minutes is possible with the new Johnson No. 130 Tool Room furnace according to time tests. Design and engineering features enable this hi-speed steel, heat treating furnace to reach maximum temperatures 25% faster than other models.



The furnace may be seen in operation at the Machine and Tool Progress Exhibition, Booth No. 321. Also in operation will be the new No. 570 pot-hardening and metal melting furnace. It is designed for economical salt, cyanide and lead-hardening and is particularly efficient for case-hardening tools and dies.

Full information about the No. 130 or No. 570 furnaces will be sent on request. Write Johnson Gas Appliance Co., 611 E. Ave., N. W., Cedar Rapids, Iowa.

New Tool Room Lathe for Small Diameter Work

THE new Model A 9-inch tool room precision lathe illustrated herewith has been designed particularly for small diameter work which requires more than the average degree of accuracy. It is unusually sensitive in operation but sturdy in construction. It has a maximum collet capacity of ½", maximum swing over bed way of 9⅛", and a maximum swing over cross slide of 5½".

(Continued on Next Page)

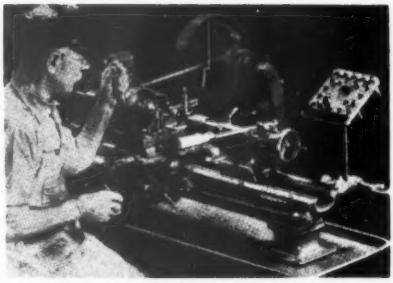
Lathe for Small Diameter Work

(Continued from Preceding Page)

The three bed lengths which are available provide center distances of 16″, 22″ and 28″ respectively. Spindle speeds are twelve in number and range from 41 to 1270 RPM on the motor drive models. Smooth operation at high speeds is assured by direct belt drive to the spindle for speeds above 400 RPM. When slow speeds are required for machining larger diameters a wrenchless bull gear lock permits engaging the back gears quickly.

The quick change gear mechanism provides 48 power longitudinal feeds, 48 power cross feeds and 48 pitches of screw threads, right or left hand. The completely automatic apron has a powerful worm drive and friction clutch for operating both the automatic power cross feeds and the automatic power longitudinal feeds. It is impossible to engage the half nuts when the power carriage feeds are in use because of an automatic safety interlock. This new South Bend Model A 9-inch tool room lathe is made in the bench type with motor drive, floor type with pedestal motor drive, as illustrated, and in both bench and floor types with countershaft drive.

Equipment includes hand wheel type draw-in collet chuck, collet rack, taper attachment, thread dial indicator, micrometer carriage stop, and chip pan. Efficient electric grinding attachment, milling attachment, and oil pump along with chucks and accessories are available on order.



This model and all other South Bend Lathes are fully described in Catalogue No. 50-TD. Please address South Bend Lathe Works, 199 East Madison St., South Bend, Indiana.

These cam clamps combine fast action and low cost of a standard toggle clamp with the tremendous holding power and the variations of a cam movement.

KNU-VISE CLAMPS are standard equipment with 95% of the aircraft, automobile and accessories plants throughout the United States. Only Knu-Vise Toggle Clamps have the universal action hinged base, cam activated pressure, Torrington Needle Bearings, and other improved features.

The complete line of toggle action tools—52 varied models—are available for immediate delivery. Send for catalog. Celluloid templates available at $1.00 each.

KNU-VISE INCORPORATED

16841 Hamilton Ave. Detroit, Mich.

Santa Monica Blvd. at Normandy Los Angeles, Cal.

W. C. Lipe, Inc., Announces Automatic Bar Feed Unit

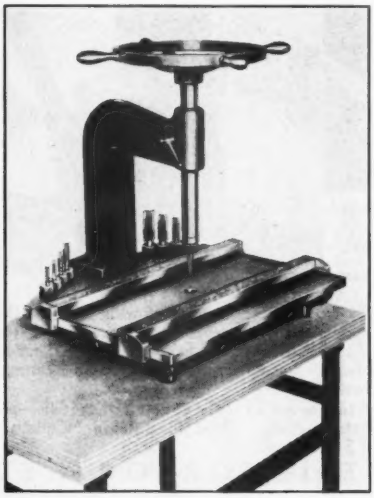
THE illustration is of a Lipe Pneumatic Bar Feed unit. It has a self-contained automatic power stock feed for use with machine tools which have fixed stops for determining length of work. It feeds without surface contact and thus will not scratch. It is intended to obviate the necessity for feed fingers, collars, chucks, ratchets, rollers, wobble-plates and similar types of feed parts used on turret lathes, screw and cutoff machines.

The stock is always held firmly against the stop until the collet is closed. The device is easily adjustable for feeding any distance or amount. The whipping of stock in guards is entirely eliminated and in addition to the more ordinary kinds of material which can be fed, it is especially valuable for the handling of aluminum, thin tubing, polished brass, plastics, and rectangular shapes. The safety factor is important because the feed unit is entirely enclosed and feed power cannot be applied until cylinder is locked in correct working position.

The Lipe Pneumatic Bar Feed unit consists of an air cylinder long enough to contain bar stock of full length. The cylinder is opened at the forward end

(Continued on Next Page)

The VIKING TAPPER—
A PRECISION BUILT TOOL



Base, semi-steel casting, well ribbed and seasoned to prevent warping.
Two sliding parallel bars to hold work in place while tapping.
Quick changing adaptors, requiring but 5 seconds to change tap.
Steel spindle hardened, ground and lapped to a perfect gage fit.
Spindle lock for holding spindle in position.
Two spindle bearing bushings hardened, ground and lapped.
Aluminum handwheel with four inserted steel handles.
Bracket arm, semi-steel casting bottom scraped to insure spindle is perfectly square with base.

Capacity ¼" to ⅞".

Send for Circular

THE VIKING TOOL & MACHINE CORP.

6 Main St. Belleville, N. J.

Pneumatic Bar Feed Unit

(Continued from Page 58)

and has within it a piston with a ball bearing cup center in which the free end of the bar is supported. The entire unit is mounted on two fabricated steel standards. In operation, the piston is forced forward against the bar stock by a very low air pressure and thus it moves the stock forward instantly when the collet opens. Movement is very rapid and accurate because the stock is always held firmly against the stop.

Air pressure is automatically shut off and forward motion ceases when the piston reaches the forward end of the cylinder. Reloading is simple, the new bar being placed against the short length which it moves forward until completely used. The Lipe Pneumatic Bar Feed is available in the following models: No. 125-Capacity, 1" dia., 12' long; No. 225-Capacity, 2" dia., 12' long; No. 300-Capacity, 2½" dia., 12' long. Additional information about these models or about application to other types of equipment may be had by writing W. C. Lipe, Inc., Department TD, Syracuse, New York.

Allegheny Ludlum "Blue Sheets" Now Available to Shop Men

THE Allegheny Ludlum Steel Corporation announces that henceforth its "Blue Sheets", which are the company's certified laboratory research data on its special steels, are released for general use in so far as copyright restrictions are concerned. This decision will be welcomed by tool, die and production men engaged in Defense work because it releases valuable information on the properties of tool, stainless, electrical and nitriding steels and prescribes the most effective methods of fabrication and use. The removal of restrictions applies to Blue Sheets already released and those scheduled for future publication and thus is made available much technical data which should be of assistance to men who are charged with the responsibility for selecting the most efficient steels for specific applications.

Industry key men may receive the Blue Sheets by writing Allegheny Ludlum Steel Corporation, Tool Steel Division TD, Watervliet, New York.

Knurling . . .

MAKES THE DIFFERENCE

UNBRAKO

Reg. U. S. Pat. Off.

SOCKET HEAD CAP SCREWS

Fingers gear right to the knurling—turn the Screw faster and farther before applying the wrench. And compared with your fingers a wrench is both clumsy and awkward—that's why mechanics and production men prefer the "Unbrako".

Production rushed?—then you'll find this famous "Unbrako" feature—AT NO EXTRA COST—a real advantage.

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. Box 600

— BRANCHES —

BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

Recent Industry Publications

"COST REDUCING TOOLS FOR THE TOOL ROOM"—the new Air Mail Edition of the Boyar-Schultz Corporation's new circular on their well-known line of tool room products is now ready for shop distribution. Illustrating and giving applications and specifications of their two profile grinders, mounted grinding wheels, their line of SMB Bolts and Copper Head Laps, this circular will be sent on requests made to Boyar-Schultz Corporation, 2112 Walnut St., Chicago, Ill.

"FABRICATION OF ALLEGHENY STAINLESS STEELS"—this bulletin covers practical shop data and design information on the two groups of Allegheny Ludlum Stainless Steels. Each process and group of design application suggestions are in separate sections. All sheets are perforated for inclusion in files or in the Allegheny Ludlum loose-leaf folders. For a copy of this bulletin write Allegheny Ludlum Steel Corporation, Pittsburgh, Pa.

ATLAS GENERAL CATALOG 41—the new 72-page catalog of the Atlas Press Company lists lathes, bench milling machines, a bench shaper, bench and floor model drills, bench grinders, motors, vises, accessories, tools and attachments. A request will bring a copy. Atlas Press Co., 312 N. Pitcher St., Kalamazoo, Mich.

"LOW COST DIE AND MOLD DUPLICATING"—The Detroit Universal Duplicator Control is analyzed in detail with particular attention given to the range of applications possible with this equipment. A wide variety of milling, shaping and die sinking can be achieved with this Control. The booklet is particularly well illustrated with set-up photographs showing the Detroit Universal Duplicator Control working on actual jobs on a number of different types of machines. A new auxiliary drive, with ultra-sensitive duplicator control, for vertical milling machines is also illustrated and described. Full specifications and a partial list of users are included. For a copy write Detroit Universal Duplicator Co., 215 St. Aubin St., Detroit, Mich.

"TANTUNG GRADE G CARBIDE TOOLS"—Bulletins G-403 and G-404 describe Tantung G, a new combination of tungsten and tantalum carbide in a matrix of cobalt and chromium. Available in either standard tool bits or in an assembly of bit and steel supporting shank, the tool is recommended for higher speed applications than possible with high speed steel in machines that do not possess sufficient rigidity, power or speed to permit use of cemented-carbide tools. Copies of these Bulletins will be sent on request. Write Fansteel Metallurgical Corp., 44 W. 22d St., N. Chicago, Ill.

CENTER SCOPE—Bulletin 1-P describes this optical instrument which locates, compensates and self-checks, and which is designed for use by the man in the tool room and die shop. It helps speed work by checking and compensating for any spindle run-out and picks up layouts quickly. For your copy of Center Scope Bulletin 1-P, write Center Scope Instrument Co., 631 S. La Brea Ave., Los Angeles, Calif.

SPEED NUTS—a new 4-page Bulletin, No. 136, shows seventeen representative assembly applications of Tinnerman Speed Nuts on metal, plastics and wood products. For a copy write Tinnerman Products, Inc., 2039 Fulton Rd., Cleveland, O.

"MEEHANITE IN INDUSTRY"—a booklet of reprints of articles on Meehanite castings, which have appeared in a number of technical and trade publications, is now available for distribution to shops interested in learning more about the cost of these very useful castings. Some of the principal specific applications shown are cast-to-form dies, flame hardening, machinability of Meehanite, and descriptions of the heat treating of Meehanite metal. For a copy of this booklet address Meehanite Research Institute, 311 Ross St., Pittsburgh, Pa.

WEIGHT AND DEFLECTION CHART—a Weight and Deflection Chart of flat drawn electric furnace chrome vanadium steel springs, designed to meet the requirements of the modern tool, die and stamping plant, is available from the distributor, Die Supply Company, 1390 E. 30th St., Cleveland, O.

NORTON CUT-OFF WHEELS FOR DELTA CUTTING-OFF MACHINES—a new circular gives specifications and general recommendations of the Norton cut-off wheels with special attention to their application to Delta No. 1600 Cut-Off Machines. Practical shop suggestions are given. For a copy write the Norton Company, Worcester, Mass., or Delta Mfg. Co., 640 E. Vienna Ave., Milwaukee, Wis.

"GRIFFIN HACK SAW BLADES"—a handy multi-fold circular on the Griffin line of soft center, soft back, all hard, non-strip and special alloy blades. Specifications and prices are given. For a copy write G. W. Griffin Co., Franklin, N. H.

"SAMPSON" Flexible Shaft Tool—with new electric governor, gives absolute speed control. Accurately controlled speeds from 1,000 to 20,000 rpm built in. The "Sampson" can be used for high speed grinding, rotary filing, sanding, polishing, buffing and many other applications in the metal working industry. A complete line of mill cut rotary files is also available. Literature on the "Sampson" Flexible Shaft Tool is available from A. Klingelhofer, Inc., 105 Lafayette St., New York, N. Y.

"SPARKS"—circular No. 1742 issued by Norton Company illustrates by diagram and table, the volume, relative length, the color, and stream of sparks in the commonly employed shop metals. A brief descriptive analysis is made of the significance of sparks from grinding. Copies of Form 1742 will be sent on request by the Norton Company, Worcester, Mass.

"EXPLORING THE UTILITY OF A GENUINE DEVELOPMENT"—this 20-page booklet explains the development of "Sturaco" extreme pressure (EP) lubricants. This line of lubricating oils and greases have had their original load carrying capacity substantially increased by approved

(Please turn to Page 62)

Colonial Adds Pull-Down Broaching Machines

A COMPLETE line of standard sizes of 3 to 20 tons capacity and 24 to 60-inch strokes are now available in Colonial PULL-DOWN Broaching Machines. Larger tonnages may be had on special order.

The Pull-down type of broaching machine is particularly desirable when used in the manufacture of precision parts which may be damaged if dropped. The part to be broached lies flat on the platen, or is held in a fixture which, in turn, is mounted on the platen. The Pull-down broaching machine is especially valuable when the part to be broached must be accurately indexed as in locating a splined hole in relation to the teeth of a gear. Colonial Pull-down machines handle the broach entirely automatically which is accomplished by a hydraulic mechanism at the top of the column, thus the operator never is required to touch the broach. In the operating cycle the broach is held at the top of its stroke by the handling mechanism and uncoupled at the bottom to place the part in position on the platen. When the pilot on the broach passes through the part, the broach automatically is attached to the pull-down mechanism and uncoupled at the top.

When the part is removed, the broach is pushed upward until it engages in the cup of the automatic handling mechanism. It then returns to the top

(Continued on Page 63)

TRU-GROUND SHOULDER

SCREWS • DOWEL PINS

ALLEN accuracy

holds your work

true to close-tolerance limits

Diemakers find in Allen Hollow Screws the qualities indispensable to accurate locating of work and retention of assemblies.

The Socket Head Cap Screws and Shoulder Screws (Stripper Bolts) are *"pressur-formd"* to preserve *continuous* steel-fibres shaped to the contour of the screw head, increasing strength for tight set-ups. The Allen *"duo-process"* threading makes the axial fibres of the steel conform to the contours of the thread profile, — structurally reinforces thread-accuracy that evenly distributes friction-pressure over the entire length of the thread.

The Dowel Pins (like the Hollow Screws) are made of special *Allenoy* steel, ground to exceedingly close tolerance limits, with tensile strength of 240,000 to 250,000 lbs. per square inch.

Ask for descriptive folder G-21

THE ALLEN MANUFACTURING COMPANY
Hartford, Connecticut, U. S. A.

Recent Industry Publications

(Continued from Page 60)

chemical additives. A simple shop explanation of EP pressure is given as well as a number of actual applications. The entire specifications of "Sturaco" process oils and greases are given. There is also a list of both engineering service and delivery points of Stuart products. For your copy of this booklet write D. A. Stuart Oil Co., Ltd., 2733 S. Troy St., Chicago, Ill.

AMMCO 6" SHAPER—"a precision machine of a thousand uses," has quick adjustment of stroke, ram position, tool head, table height, table support, speed and feed. Table has five cross feeds, reversible; countershaft has three-step cone pulley. For specifications and prices write Automotive Maintenance Machinery Co., 2108 Commonwealth Ave., N. Chicago, Ill.

THE ADVANTAGES OF A WATER SOLUBLE CUTTING COMPOUND are given in a copy of an actual report made by the Master Mechanics Division of a large automobile manufacturer, and published by the producer, Wayne Chemical Products Co. Because the report is exactly in the original form, except that name identities are omitted, it will be of interest to all shops and departments that use coolants. A copy of the report is available from Wayne Chemical Products Co., 9425 Copeland Ave., Detroit, Mich.

GLENCO COMPENSATING TOOL HOLDER—this newest addition to the Glenzer line of utility tools—is provided with a free floating compensator equipped with driving bushings and offers a positive correction for misalignment on adjustable multiple spindles, tapping and drilling machines of all kinds, and hand and automatic screw machines. Circular "J", giving full details, will be sent on request. The J. C. Glenzer Co., 6467 Epworth Blvd., Detroit, Mich.

MONARCH METAL—A new bearing and seal bronze, available in three analyses for a wide range of work, is described in a new leaflet issued by Monarch Alloys Co., Ravenna, O. A copy will be sent by the manufacturer.

FORMICA DATA BOOK—this general catalog lists the wide variety of mechanical parts made from this laminated plastic product. A description of the making of Formica and a Symbol Chart of the grades of Formica, tables of average properties and specific applications are also included. A copy of this booklet will be sent on requests made to The Formica Insulation Company, 4640 Spring Grove Ave., Cincinnati, O.

THE BLACK & DECKER NEW 1941 CATALOG—describes for the first time a new ¼" popular-priced Standard Ball Bearing Drill. It has been designed with special attention to compactness and light weight combined with high power action. Has anti-friction bearings throughout, splined gear mounting, locked inner and outer races, and removable commutator end cover. Close offset, end or side handle, adapts the drill particularly to aircraft and similar types of work. Full range of spindle speeds with drill capacity in steel to ¼", in hardwood to ½". Standard speed is 2000 R.P.M., with 3500 to 5000 R.P.M. available. Write the Black & Decker Company, Department AEB, Towson, Maryland, for detailed description and copy of 1941 Catalog.

NEW JOHNSON BRONZE BEARING CATALOGUE—The new Johnson 1941 catalogue of Bearing Bronze, including general purpose, graphited, and electric motor bearings, is ready for distribution. Many important changes are listed, both by way of additional items and new types of bearings. The company's stock is said to include millions of finished bronze bearings, tons of machined bronze bars, all of which are in hundreds of sizes. The company's strategically located warehouses in 21 key cities and hundreds of distributors from coast to coast make it possible to ship from stock on the day an order is received. For copy of catalogue write Johnson Bronze Company, 300 South Mill Street, New Castle, Pa.

"POWER TOOLS"—a new, attractive catalog describing the band saws, drill presses, planers, shapers, jointers, lathes and other equipment is now available for distribution. Ask for Catalog T when you write Boice-Crane Co., 930 W. Central Ave., Toledo, O.

"DESIGN WITH CONFIDENCE . . . "—a new, folding type brochure which describes and illustrates twelve widely varying industrial applications of the different types of Meehanite castings. It also briefly describes the four general classifications under which Meehanite castings are manufactured. Ask for Bulletin No. 12 when writing to Meehanite Research Institute, 311 Ross St., Pittsburgh, Pa.

STANLEY TOOLS FOR INDUSTRY—a new Catalog, No. 50-T, covering the Stanley power tools is now being distributed. A new feature is the identification of tools suitable for aircraft work. Two indexes make the Catalog very easy to refer to. Write Stanley Tools, New Britain, Conn.

FOREDOM FLEXIBLE SHAFT TOOLS—a circular describing these flexible shaft tools designed particularly for use in tool, die, mold and pattern shops. Manufactured for almost 20 years, Foredom tools are in use in many of the country's largest manufacturing plants as well as Federal, state, and municipal departments. A feature of the Foredom line is a wide choice of hand pieces, all of which are designed particularly so that they may be held closely to the tip to assure positive and accurate control. The Series 400 appeals to shops which require an exceptionally wide range of speeds. There is a quick, simple method of change-over, the motor having a worm-drive gear reduction at one end into which the flexible shaft assembly is fastened when low speeds are called for. For high speeds, the opposite end is utilized. For a copy of Folder TD and additional information about Foredom products, write Foredom Electric Company, 27 Park Place, New York, New York.

Pull-Down Broaching Machines

(Continued from Page 61)

of the stroke, ready for insertion of the next part to be broached. This new line of Pull-down broaching machines conforms to thoroughly proven Colonial design and welded steel construction.

Information may be had by writing Colonial Broach Company, Department TD, 145 Jos. Campau Ave., Detroit, Michigan.

Knu-Vise to Exhibit Line of Toggle Action Clamping Tools

The complete line of toggle-action clamping tools manufactured by Knu-Vise, Incorporated, will be on exhibit in Booth No. 251 at the A.S.T.E. Show. These include toggle clamps, spring stop gauges for use on dies, tools and fixtures, hand squeeze riveters, toggle locking pliers and holding fixtures.

Write Knu-Vise, Incorporated, 16841 Hamilton Ave., Highland Park, Michigan, for complete catalog and schedule of prices.

The REID No. 2-1 Automatic Feed SURFACE GRINDER

DESIGN—Mechanical and Hand Feeds with a reciprocating table and horizontal spindle.

CAPACITY—The No. 2-1 Surface Grinder grinds work 18″ long, 6″ wide and 11½″ high, using a wheel 7″ in diameter.

SPINDLE—High-grade heat-treated Chrome-Molydenum Steel; runs in phosphor-bronze boxes. Vertical adjustments are obtained by a hand wheel graduated to .0005″.

WORK TABLE—Automatic in both directions and is controlled by dogs operating against a reverse lever.

MOTOR DRIVE—Machine requires a 1½ HP, 1800 RPM Motor. Motor is entirely enclosed in base of machine.

FLOOR SPACE—65″ x 30″.

Send for Circular.

H. LEACH MACHINERY CO.

387 Charles St. Providence, R. I.

Exclusive Selling Agents ★ Distributors in all leading Cities.

See Display at the A. S. T. E. Show

Millers Falls Introduces Double-Life Hack Saw Blades

TWO cutting edges on a single hack saw blade are now a reality with the announcement by the Millers Falls Company of their new DOUBLE-LIFE Blu-Mol Blades. The obstacles which previously prevented the successful manufacture of such a blade—the difficulty of keeping the trailing edge from dragging in the slot and the excessively high cost of breakage—have been overcome; the first by setting teeth of the first edge fractionally wider than those of the second; the second by an advancement in heat treating technique which leaves teeth hard, ends and center soft. Double-Life Blades are guaranteed unbreakable and shatter-proof.

Millers Falls reports exhaustive tests revealing that each side delivers full performance even on positive feed machines, cutting twice the usual maximum depth at each stroke; production time may thus be reduced by half on hack-sawing operations.

The new Double-Life Blade, on which patents have been applied for, is now

available through mill supply houses.

For further information on Double-Life Hack Saw Blades, call your regular supply house or write Dept. TD, Millers Falls Company, Greenfield, Mass.

new

T·J

see
Hydraulic Cylinders and other products at ASTE MACHINE and TOOL PROGRESS EXHIBITION.
Booth 230

and

jammed to the gills with practical information on Hydraulic Cylinders.

Your request on your company's letterhead brings your copy promptly.

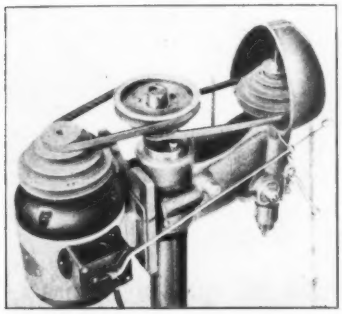
Address—

THE TOMKINS-JOHNSON CO.
630 North Mechanic Street **Jackson, Michigan**

New Delta Multi-Speed Drill Press Attachment

AN ingenious new Delta attachment that provides a wide range of speeds for both high speed and slow speed models has been developed for 14" drill presses. This attachment consists of a heavy casting which mounts in the drill press column together with a cone pulley and two belts. Belt slack is taken up by turning the casting so proper tension is always assured. A range of 12 speeds is available through various combinations.

The multi-speed unit is quickly removed and easily adjusted. A grease-sealed ball bearing pulley is used in the assembly and insures smooth, even, vibrationless running.



The Delta Multi-Speed Drill Press Attachment provides an ideal and economical way to acquire lower and higher speeds than could otherwise be obtained. With this attachment it is possible to use a standard 1725 rpm motor, where a special high or slow speed motor would ordinarily be required.

For literature and prices on the new Delta Multi-Speed Drill Press Attachment see your Delta distributor or write Delta Mfg. Co., (Industrial Division), 640 E. Vienna Ave., Milwaukee, Wis.

"Plastics Mold Designing"

NOMENCLATURE

This new book (publication date April 1) will contain the most complete Nomenclature on its subject, in addition to a section on the selection of Mold Steels.

CHICAGO MOUNTED WHEELS OF **V/T SUPER BOND**

150% LONGER LIFE

Rigid tests on snagging and exacting operations prove they have 150% to 300% longer life. Won't ridge on welds, sharp corners, sinking dies, barbering, etc. There's a shape and size to handle every grinding job faster, better, at lower cost. V/T Super Bond is the most important development in mounted wheels in 30 years.

Let us send you a trial Wheel. Tell us the kind of job, type of equipment you use and size wheel you prefer.

Free Mounted Wheel Chart

Ideal for ready reference in the shop. A Wall Chart 22 x 15" showing actual size and shape of every standard Chicago Mounted Wheel.

Handee Tool of 1001 Uses

A small "power house" that can be used wherever there is an electric outlet. Grinds, drills, polishes, cuts, routs, carves, sands, saws, sharpens, engraves, cleans, etc. Uses 300 accessories. Weighs 12 oz., 25,000 r.p.m. $18.50 postpaid with 7 accessories.

10 Days Free Trial

Send for catalog of complete line.

Chicago Wheel and Mfg. Co.

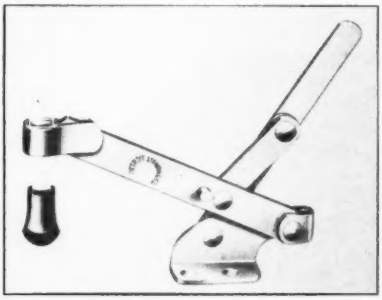
Makers of Quality Products for 40 Years

1101 W. Monroe St., Dept. TD, Chicago, Ill.

Canadian Office - 1332 William St., Montreal

New De-Sta-Co Light Weight Toggle Clamp Designed Particularly for Aircraft Work

A NEW small size, light weight toggle clamp known as "De-Sta-Co Model No. 200 Jr." has been perfected and patented by the Detroit Stamping Company. It has a clamping ratio of 33 to 1, and its design makes it particularly



efficient for the holding of parts for welding, drilling and other types of machining as well as for parts assembly. The clamp is made of cold drawn steel, is bright cadmium plated, and although it weighs only 9½ oz. it has typical De-Sta-Co holding power.

The clamp is carefully machined to assure free working but the design is such that there is no looseness at bearing points. Marring and denting of surfaces being clamped are overcome by use of a rubber bolt head to fit a ⅜" bolt. This is furnished with each clamp.

A circular describing this and other De-Sta-Co Models for either small or large work will be sent upon request to Detroit Stamping Company, 344 Midland Avenue, Detroit, Michigan.

Lempco Appoints Chicago Distributor

Tool Equipment Sales Company announces appointment as exclusive Chicago representative of Lempco Products, Inc., of Bedford, Ohio, manufacturers of grinding machines, hydraulic and elec-

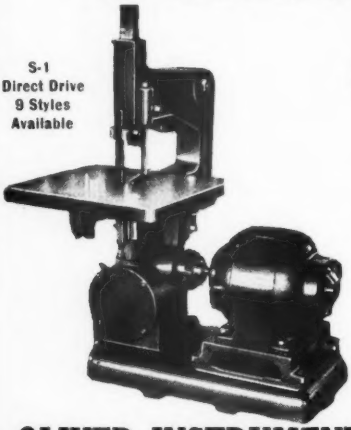
(Continued on Page 68)

Prepare Your Tool Room

FOR GREATER DEMANDS BY INSTALLING

OLIVER OF ADRIAN

DIE MAKING MACHINES



They will save 50% to 60% of the labor over hand methods.

They will relieve the pressure in your Tool and Die departments.

They will *pay their way* in actual savings.

Their use permits less skilled help on many operations.

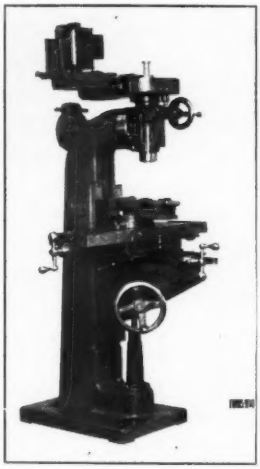
Priced as low as $125.00

SEND FOR FREE LITERATURE.

OLIVER INSTRUMENT CO. **1436 Maumee Street, East, Adrian, Michigan**

Blank & Buxton to Show New No. 40-H Index Vertical Miller

PRECISION milling, drilling and boring can be done on the Index No. 40-H high speed vertical milling machine, designed particularly for tool rooms and die shops. A hand feed through a table makes it possible to feel the progress of the cutter. The swivel head, graduated 90° each way, and 3¼" quill movement to spindle, make the machine very useful for drilling and boring on angles as well as milling. The quill movement is controlled by a screw and nut instead of the conventional rack and pinion type. The machine has a capacity of ⅛" to ⅝" end mills in tool steel, and six standard spindle speeds



ranging from 180 to 2400 rpm with single speed motor. Special two-speed motors can also be supplied. Longitudinal and cross verniers for locating milling and boring positions are standard equipment. The machine may be seen in operation in Booth No. 159 at the Machine & Tool Progress Exhibition.

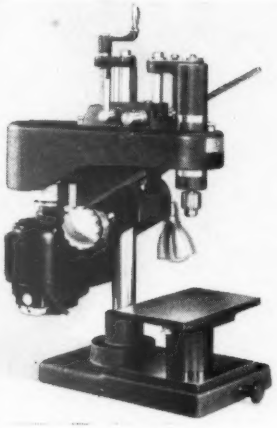
Complete details will be sent on request to Blank & Buxton Machinery Co., 3108 E. Michigan Ave., Jackson, Mich.

HAMILTON-MUEHLMATT

America's Finest

Sensitive Drilling Machines

For over a quarter century the A.M. Super Sensitive Drilling Machines have set the precision standard for drilling small holes (.004" to .250" dia.)



The Varimatic

Round table 5½", rectangular table (fitted over round table) 10" x 6".

Vertical adjustment of 8" by elevating screw.

Spindle speeds 750 to 12,000 R.P.M.

All moving parts completely guarded.

Extreme convenience of operation, bold design (protected by patents), sturdy construction and perfect workmanship assure long, accurate life. The Hamilton-Muehlmatt Super Sensitive Drilling Machines are the choice of tool and die makers everywhere.

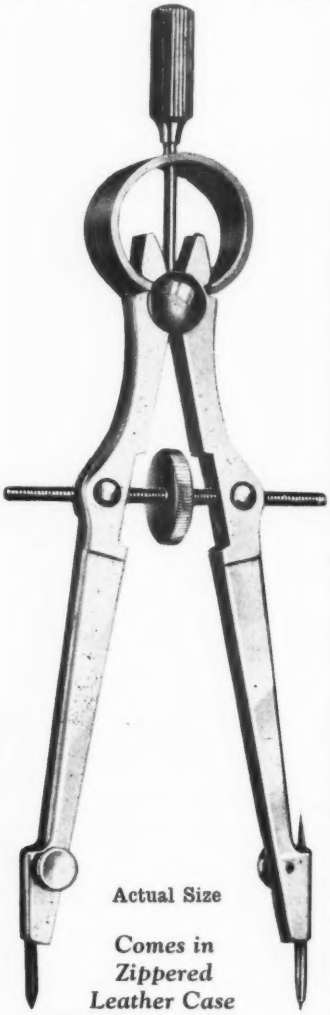
Full information on request.

THE HAMILTON TOOL COMPANY

A. MUEHLMATT DIV.

Ninth and Hanover Sts. Hamilton, Ohio

"PETCO" BOW PENCIL
Draws Circles Up To Ten Inches



Actual Size

Comes in Zippered Leather Case

Send $5.00 Now for this New High Grade Instrument

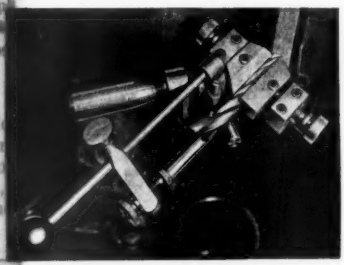
100% American Made

The Peters Co.

305 W. Congress St. Detroit, Mich.

New Drill Grinding Attachment Sharpens Drills Accurately

The Delta Mfg. Company is offering a new Drill Grinding Attachment which gives the face of the wheel the natural relief. It is a precision built unit so accurately made, so easy and simple to operate, that anyone can now do a perfect drill sharpening job. A setting attachment with an accurate scale permits micrometer settings that insure evenly ground lips so that the drills run true. The amount of lip clearance on the drill is just right with enough of the heel cut away to provide sufficient clearance without weakening the cutting edge.



An additional feature of the new Delta Drill Grinding Attachment is that even the new shop man can adjust it so that each drill can be ground to fit the job with lip clearance and angles at any degree required. Capacity: 1/8" to 5/8" drills.

Literature and prices on the new Delta Drill Grinding Attachment are available on request. Write Delta Mfg. Co. (Industrial Division), 640 E. Vienna Ave., Milwaukee, Wis.

Lempco Appoints Chicago Distributor

(Continued from Page 66)

straightening presses and electric arbors. J. B. Cole will have charge of the sale of the Lempco line.

Other lines handled include Alvord-Polk Taps and Dies; Brust Tools, Dies, and Molds; Buckeye Bronze Bushings and Bars; Cleveland Universal Drill Jigs and Fixtures; Gairing Counterbores and Special Cutting Tools; Gilmore Diamond Tools; Kelly Reamers; Universal Drill Bushings and Collet Chucks. Write Tool Equipment Sales Co., 24 South Pulaski Road, Chicago, or telephone Van Buren 6220 for information.

Buy With Confidence

- This directory of products lists for ready reference the names of manufacturers and dealers whose sales to the TOOL and DIE Journal readers have established them as dependable in every sense of the word. They merit your consideration.
- Complete information about any product may be had upon request made to the firm listed or to us.
- Your mention of the TOOL and DIE Journal will be appreciated.

ABRASIVE PAPER AND CLOTH
Carborundum Co., Niagara Falls, N. Y.
Norton Co., Worcester, Mass. (Behr-Manning Div.)

ASSEMBLING MACHINES—Automatic
Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, Ohio.

BAR STOCK—Heat Treating
Lakeside Steel Improvement Co., 5418 Lakeside Ave., Cleveland, Ohio.

BARS—Rolled Composite
Forging and Casting Corp., Ferndale (Detroit), Michigan.

BOLTS—Stripper
Allen Mfg. Co., Hartford, Conn.
Holo-Krome Screw Corp., Hartford, Conn.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.

BORING HEADS—Offset
Precision Tool Co., The, P. O. Box 155, Brooklyn, N. Y.

BROACHING PRESSES—Standard and Utility
Colonial Broach Co., 147 Jos. Campau, Detroit, Mich.

BUSHINGS—Die
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.

BUSHINGS—Drill
Universal Engineering Co., Frankenmuth, Mich.

CALIPERS
L. S. Starrett Co., Athol, Mass.
Lufkin Rule Co., Saginaw, Mich.

CAMS
George Gorton Machine Co., 1319 Racine St., Racine, Wisconsin.

CAP SCREWS—Flat Head
Allen Mfg. Co., Hartford, Conn.

CAP SCREWS—Socket Head
Allen Mfg. Co., Hartford, Conn.

CARBIDE TOOLS AND BLANKS
Ex Cell-O Corporation, 1206 Oakman Blvd., Detroit, Mich.
Gairing Tool Co., The, 1631 Lafayette Blvd., Detroit, Mich.
McKenna Metals Company, 500 Lloyd Ave., Latrobe, Pa.
Motor Tool Mfg. Co., 12283 Turner Ave., Detroit, Mich.

CASTINGS—Air and Oil Hardening Tool Steel Cast to Shape
Forging and Casting Corp., The, Ferndale (Detroit), Mich.

CASTINGS—Nitri-Cast-Iron
Forging and Casting Corp., The, Ferndale (Detroit), Mich.

CHUCKS—Collet
George Gorton Machine Co., 1319 Racine St., Racine, Wisconsin.
The Tomkins-Johnson Co., 630 North Mechanic St., Jackson, Mich.

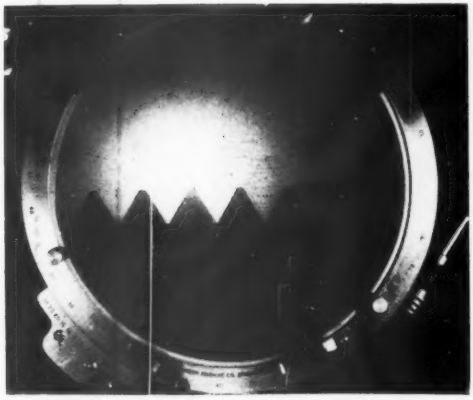
CLAMPS—Die
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

CLAMPS—Toggle
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Detroit Stamping Co., 344 Midland Ave., Detroit, Mich.
Knu-Vise, Incorporated, 16841 Hamilton Ave., Highland Park, Michigan.

CLAMPS—Toolmakers
L. S. Starrett Co., Athol, Mass.

SCREW THREAD

Ground by



ACME INDUSTRIAL CO.

Makers of Standardized Jig and Fixture Bushings

206 N. Laflin St. Chicago, Ill. MONroe 4122

COMPOSITE DIE SECTION STEEL
Jessop Steel Co., 610 Green St., Washington, Pa.

COMPOUNDS—Anti-Rust
Wayne Chemical Products Co., 9425 Copeland Ave., Detroit, Mich.

COMPOUNDS—Cutting
Wayne Chemical Products Co., 9425 Copeland Ave., Detroit, Mich.

COMPOUNDS—Driving, Drawing, Stamping Metal
Wayne Chemical Products Co., 9425 Copeland Ave., Detroit, Mich.

COMPOUNDS—Grinding
Wayne Chemical Products Co., 9425 Copeland Ave., Detroit, Mich.

CONTOUR METAL-WORKING MACHINES
Continental Machines, Inc., 1303 S. Washington Ave., Minneapolis, Minn.

COUNTERBORES
Allen Mfg. Co., Hartford, Conn.
Putnam Tool Co., 2985 Charlevoix Ave., Detroit, Mich.

CRANKSHAFTS—Heat Treated for Presses
Enterprise Machine Parts Corp., 2735 Jerome Ave., Detroit, Mich.

CUTTERS—Die-sinking
George Gorton Machine Co., 1319 Racine St., Racine, Wisc.
The Tomkins-Johnson Co., 630 North Mechanic St., Jackson, Mich.

CUTTER GRINDER
George Gorton Machine Co., 1319 Racine St., Racine, Wisconsin.
Oliver Instrument Company, 1436 Maumee St., E., Adrian, Michigan.
Norton Company, Worcester, Mass.

CUTTERS—Hard Carbide
McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.

CUTTERS—Milling
Gairing Tool Co., The, 1631 Lafayette Blvd., Detroit, Mich.
Motor Tool Mfg. Co., 12283 Turner Ave., Detroit, Mich.
Putnam Tool Co., 2985 Charlevoix, Detroit, Mich.
Severance Tool Mfg. Co., 1506 E. Genesee Ave., Saginaw, Mich.
Tomkins-Johnson Co., 630 N. Mechanic St., Jackson, Mich.

CUTTING TOOLS
National Twist Drill and Tool Co., Detroit, Mich.

CYLINDERS—Hydraulic
Tomkins-Johnson Co., 630 N. Mechanic St., Jackson, Mich.

CYLINDERS—Pneumatic
Tomkins-Johnson Co., 630 N. Mechanic St., Jackson, Mich.

DIAMOND STONES
Carborundum Co., Niagara Falls, N. Y.
Norton Company, Worcester, Mass.

DIAMOND TOOLS
Koebel Diamond Tool Co., 9350 Grinnell, Detroit, Mich.

DIAMOND WHEELS
Carborundum Co., Niagara Falls, N. Y.
Norton Company, Worcester, Mass.

DIE CASTING MACHINES
Phoenix Machine Co., The, 2711 Church Ave., Cleveland, Ohio.

DIE CENTERS—Hard Carbide
McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.

DIE FILING MACHINES
Illinois Tool Works, 2503 N. Keeler Ave., Chicago, Ill.

DIE HANDLING TRUCKS
Hamilton Tool Co., Ninth and Hanover Sts., Hamilton, Ohio.

DIE MAKERS SUPPLIES
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

DIE MAKING MACHINES
Continental Machines, Inc., 1303 S. Washington Ave., Minneapolis, Minn.
Oliver Instrument Co., 1436 Maumee St., E., Adrian, Mich.

DIE SECTIONS—Composite Steel
Forging and Casting Corp., Ferndale (Detroit), Michigan.
Jessop Steel Co., 610 Green St., Washington, Pa.

DIE SECTIONS—Forged
Ajax Steel and Forge Co., 205 Adair St., Detroit, Mich.

DIE SETS
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
F. C. Danneman Co., 203 Lafayette St., New York, N. Y.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.

DIE STEELS
Jessop Steel Co., 610 Green St., Washington, Pa.

DOWEL PINS
Acme Industrial Co., 206 No. Laflin St. Chicago, Ill.
Allen Mfg. Co., Hartford, Conn.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.

DRAWING INSTRUMENTS
Peters Co., The, 305 W. Congress St., Detroit, Mich.

DRESSING STICKS
Carborundum Co., Niagara Falls, N. Y.
Norton Company, Worcester, Mass.

DRILL HEADS—Adjustable
Linderme Machine and Tool Co., 12250 Coyle Ave., Detroit, Mich.

DRILL JIG—Toggle Action
Knu-Vise, Incorporated, 16841 Hamilton Ave., Highland Park, Michigan.

DRILL JIG BUSHINGS
Acme Industrial Co., 206 No. Laflin St. Chicago, Ill.

DRILL POINTERS
Oliver Instrument Co., 1436 E. Maumee St., Adrian, Mich.

DRILLING MACHINES—Automatic
Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, Ohio.

DRIVE UNITS—Motorized
Cullman Wheel Co., 1332 Altgelt St., Chicago, Ill.
Drive-All Mfg. Co., 3200 Conner Ave., Detroit, Mich.

DUPLICATOR MACHINES
George Gorton Machine Co., 1319 Racine St., Racine, Wisc.

Send for Valuable Booklet

Forgings For All Industries

Rough Turned or Finished Complete

●

Composite Die Sections
Extrusion Tools
Crankshaft Forgings
Gear Forgings
Die Casting Dies

●

Rings, Discs, Blocks, Shafts, Hubs, Bars, and Special Shapes.
Tool Steel of all Makes

S.A.E. Specifications

STAINLESS & COPPER FORGINGS

May We ServeYou?

AJAX STEEL AND FORGE Co.

205 ADAIR STREET **DETROIT, MICHIGAN**

ELEVATING TABLES—Portable
Hamilton Tool Co., The, Ninth and Hanover Sts., Hamilton, Ohio.

END MILLS
Gairing Tool Co., The, 1631 Lafayette Blvd., Detroit, Mich.
The Tomkins-Johnson Co., 630 North Mechanic St., Jackson, Mich.
Putnam Tool Co., 2985 Charlevoix, Detroit, Mich.

EXTRACTOR—Broken Tap
The Walton Co., 88 Allyn St., Hartford, Conn.

FILES—RIFFLERS
American Swiss File and Tool Co., Elizabeth, N. J.

FILES—Rotary
American Swiss File and Tool Co., Elizabeth, N. J.
Hamilton Tool Co., The, Ninth and Hanover Sts., Hamilton, Ohio.
Grobet File Co. of America, 3 Park Place, New York City, N. Y.
Severance Tool Mfg. Co., 1506 E. Genesee Ave., Saginaw, Mich.

FILES—Swiss Pattern
American Swiss File and Tool Co., Elizabeth, N. J.

FILING MACHINES
Oliver Instrument Co., 1436 E. Maumee St., Adrian, Mich.

FILING MACHINES—Continuous
Continental Machine Specialties, Inc., 1303 Washington Ave., S., Minneapolis, Minn.

FLAME HARDENING
Lakeside Steel Improvement Co., 5418 Lakeside Ave., Cleveland, Ohio.

FORGINGS—General
Ajax Steel & Forge Co., 205 Adair St., Detroit, Mich.

FORGINGS—Water and Oil Hardening, High Speed, Special Alloy, Stainless and S. A. E. Steel
Forging and Casting Corp., Ferndale (Detroit), Michigan.

FURNACES—Case Hardening
Johnson Gas Appliance Co., 611 E. Ave., N. W., Cedar Rapids, Iowa.

FURNACES—Tempering and Drawing
Despatch Oven Co., 600 S.E. Ninth St., Minneapolis, Minn.

GAGE BLOCKS
Ford Motor Co., Johansson Division, Dearborn, Mich.

GAGES—Carbide Tipped
McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.

GAGES—Center, Depth, Planer, Telescoping, Surface, etc.
The Lufkin Rule Co., Saginaw, Mich.
L. S. Starrett Co., Athol, Mass.

GAGES—Combination Height and Depth
Continental Machines, Inc., 1303 S. Washington Ave., Minneapolis, Minn.

GAGES—Dial
L. S. Starrett Co., Athol, Mass.

GAGES—Precision
Sheffield Gage Corp., 1530 E. Third St., Dayton, O.

GAGES—Spring Stop
Knu-Vise, Incorporated, 16841 Hamilton Ave., Highland Park, Michigan.

GAGE BLOCKS
Ford Motor Co., Johansson Div., Dearborn, Mich.
George Scherr Co., 128-B Lafayette St., New York, N. Y.

GRINDER—Cylindrical
Norton Company, Worcester, Mass.

GRINDER—Hydraulic Feed
Gallmeyer & Livingston Co., 304 Straight Ave., S.W., Grand Rapids, Mich.

GRINDER—Portable
Dumore Company, Racine, Wis.
McGonegal Mfg. Co., Everett Pl. and Orchard St., E. Rutherford, N. J.

GRINDER—Surface
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Builders Iron Foundry, Providence, R. I.
Gallmeyer & Livingston Co., 304 Straight Ave., S.W., Grand Rapids, Mich.
Norton Company, Worcester, Mass.

GRINDER—Precision for Contours
Baker Brothers, Inc., Toledo, O.
Boyar-Schultz Corp., 2112 Walnut St., Chicago, Ill.
Koestlin Tool & Die Corp., 3601 Humboldt Ave., Detroit, Mich.

GRINDER—Universal
Norton Company, Worcester, Mass.
Oliver Instrument Co., 1436 Maumee St., E., Adrian, Michigan.

GRINDER CENTERS
McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.

GRINDER TOOL
Norton Company, Worcester, Mass.

GRINDING MACHINES—Cutter
Oliver Instrument Co., 1436 Maumee St., E., Adrian, Michigan.

GRINDING MACHINES—Tap
Oliver Instrument Co., 1436 Maumee St., E., Adrian, Michigan.

GRINDING & LAPPING—Precision
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.

GRINDING WHEELS
Carborundum Company, The, Niagara Falls, New York.
Norton Company, Worcester, Mass.

GUIDE PINS
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.

HAMMERS & MALLETS—Rawhide
Chicago Rawhide Mfg. Co., 1280 Elston Ave., Chicago, Ill.

INDICATORS
The Lufkin Rule Co., Saginaw, Mich.

INDICATORS—Dial
L. S. Starrett Co., Athol, Mass.

INDICATORS—Test
L. S. Starrett Co., Athol, Mass.

INDEXING DEVICES
Hartford Special Machy. Co., Hartford, Conn.

KEYS—Socket Screw
Holo-Krome Screw Corp., Hartford, Conn.

Complete Manufacturing Facilities

Over 50,000 Square Feet of Floor Space

TOOLS, DIES — GAGES — JIGS, FIXTURES
SPECIAL MACHINERY — METAL SPECIALTIES
JIG BORING — DESIGN AND DEVELOPMENT

Punch Presses
Kingsbury Drilling Machines
High Speed Tapping Machines
Multislide

Injection Moulding
Spring Winders
High Speed Blanking
Spot Welders
Conveyors

Send prints or sample for prompt estimate

FEDERAL TOOL CORPORATION

400 North Leavitt Street - - - - Chicago, Illinois

LAPS—Copper Head Expansion
Boyar-Schultz, Inc., 2112 Walnut St., Chicago, Ill.

LAPPING COMPOUND
Carborundum Co., Niagara Falls, N. Y.

LAPPING MACHINES
Schraner & Co., A. P., 3338 Payne Ave., Cleveland, Ohio.
Norton Company, Worcester, Mass.

LATHE CENTERS
McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.

LATHES—Toolroom
Atlas Press Co., 312 N. Pitcher Ave., Kalamazoo, Mich.
South Bend Lathe Works, 200 E. Madison St., South Bend, Ind.

LAYOUT DYE
Michigan Chrome and Chemical Co., 6370 E. Jefferson Ave., Detroit, Mich.

LEADER PINS
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.

MACHINE REBUILDING
Enterprise Machine Parts Corp., 2735 Jerome Avenue, Detroit, Mich.

MACHINE VISES
Gorton Machine Co., George, 1319 Racine St., Racine, Wisconsin.

MARKING DEVICES
AcromarK Company, The, (H. O. Bates), 261 North Broad Street, Elizabeth, N. J.

METAL DUPLICATING MACHINES
O'Neil-Irwin Mfg. Co., 316 8th Ave. So., Minneapolis, Minn.

MICROMETERS
The Lufkin Rule Co., Saginaw, Mich.
L. S. Starrett Co., Athol, Mass.
Geo. Scherr Co., Inc., 128-B Lafayette St., New York, N. Y.

MILLING MACHINES—Attachments
Gorton Machine Co., George, 1319 Racine St., Racine, Wisc.
Kearney & Trecker Corp., West Allis Station, Milwaukee, Wis.

MILLING MACHINES—Vertical
Gorton Machine Co., George, 1319 Racine St., Racine, Wisc.
Kearney & Trecker Corp., West Allis Station, Milwaukee, Wisc.
Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, Ohio.

MILLING MACHINES—Continuous
Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, Ohio.

NUMBERING DEVICES
AcromarK Company, The, (H. O. Bates), 261 North Broad Street, Elizabeth, N. J.

OVENS—Industrial
Despatch Oven Co., 600 S.E. Ninth St., Minneapolis, Minn.
Johnson Gas Appliance Co., 611 E. Ave., N. W., Cedar Rapids, Iowa.

PLATES—Bench, Lapping, Surface
Challenge Machinery Co., Grand Haven, Mich.

PLUGS—Hollow Pipe
Holo-Krome Screw Corp., Hartford, Conn.

POLISHING & BUFFING MACHINES—Automatic Continuous
Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, Ohio.

POLISHING GRAIN
Carborundum Co., Niagara Falls, N. Y.
Norton Company, Worcester, Mass.

PRESSES—Arbor
Atlas Press Co., 312 N. Pitcher St., Kalamazoo, Mich.

PUNCHES—Hand, Toggle Action
Knu-Vise, Incorporated, 16841 Hamilton Ave., Highland Park, Michigan.

PUNCHES—Standard & Interchangeable
Hovis Screwlock Co., 8100 E. Nine Mile Road, Van Dyke, Mich.

RACKS—Bar Stocks
Wm. S. Yohe Supply Co., 507 Gibbs Ave., N. E., Canton, O.

REAMERS
Gairing Tool Co., The, 1631 Lafayette Blvd., Detroit, Mich.
Putnam Tool Co., 2985 Charlevoix Ave Detroit, Mich.

REAMER—Self-centering Cylinder
Royal Oak Tool & Machine Co., 621 E. Fourth Street, Detroit, Mich.

REPAIR PARTS FOR MACHINERY
Enterprise Machine Parts Corp., 2735 Jerome Ave., Detroit, Mich.

RETAINERS—Punch & Die
Hovis Screwlock Co., 8100 E. Nine Mile Road, Van Dyke, Mich.

RIVETING MACHINES—Hydraulic
Tomkins-Johnson Company, The, 630 N. Mechanic St., Jackson, Mich.

ROLL FEEDS—Automatic
Wittek Mfg. Co., 4305 W. 24th Place, Chicago, Ill.

SAWING MACHINERY
Tannewitz Works, The, Grand Rapids, Mich.

SAWING MACHINES—Continuous
Continental Machine Specialties, Inc., 1303 So. Washington St., Minneapolis, Minn.

SAWING MACHINES—Metal
Armstrong-Blum Mfg. Co., 5757 Bloomingdale Ave., Chicago, Ill.

SAWS—Band
DoAll Co., Inc., 1203 Thacker St., Des Plaines, Ill.

SCREW MACHINE PRODUCTS—Contract
Star Machine & Tool Co., 9320 Woodland Ave., Cleveland, Ohio.

SCREW MACHINE PRODUCTS—Hardened & Ground
Acme Industrial Co., 206 No. Laflin St., Chicago, Illinois.

SCREWS—Socket Head
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.
Holo-Krome Screw Corp., Hartford, Conn.
Strong, Carlisle & Hammond Co., 1392 West Third St., Cleveland, Ohio.
L. S. Starrett Co., Athol, Mass.

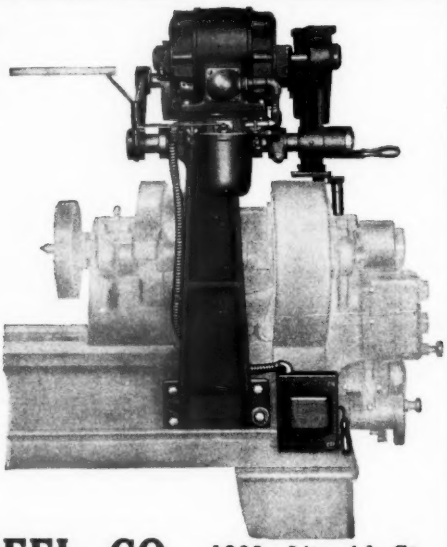
CULLMAN DRIVES

Drive your machines direct.

Eliminate overhead lineshafts.

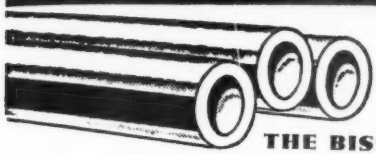
Cullman drives are made for Lathes, Shapers, Milling Machines, Punch Presses and many other types of machines.

Send for Information



CULLMAN WHEEL CO. 1332 Altgeld St., Chicago, Ill.

OIL HARDENING TOOL STEEL TUBING



Substantially reduces labor costs by eliminating the expensive procedure of drilling from the solid.

BISCO TOOL STEEL TUBING is a fine grade tool steel in tubular form available in sizes up to 14" diameter and 2" wall thickness; other sizes to your specification.

Tool Steels Alloy Steels Stainless Sheets and Bars

THE BISSETT STEEL COMPANY 947 E. 67th St. Cleveland, Ohio

SET SCREWS—Hollow
Allen Mfg. Co., Hartford, Conn.

SET SCREWS—Square Head
Allen Mfg. Co., Hartford, Conn.

SHAPERS
Atlas Press Co., 312 N. Pitcher St., Kalamazoo, Mich.

SHARPENING STONES
Carborundum Co., Niagara Falls, N. Y.
Norton Company (Behr-Manning Div.), Worcester, Mass.

SINE BARS
Ford Motor Co., Johansson Div., Dearborn, Mich.

SPACERS—For Milling Machine Arbors
Detroit Stamping Co., 3443 West Fort St., Detroit, Mich.

SPRINGS—Die
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.
Precision Spring Corp., 15400 Woodrow Wilson Ave., Detroit, Mich.

SPROCKETS—Roller and Block
Cullman Wheel Co., 1332 Altgeld St., Chicago, Ill.

SQUARES—Combination, Try and Mitre
The Lufkin Rule Co., Saginaw, Mich.
L. S. Starrett Co., Athol, Mass.

STAMPINGS
Barth Stamping & Mach. Works, W. 34th & Denison, Cleveland, Ohio.
Davis Tool & Engineering Co., 6481 Epworth Blvd., Detroit, Mich.
Denning Mfg. Co., The, 1775-81 E. 87th St., Cleveland, Ohio.
Detroit Stamping Co., 344 Midland Ave., Detroit, Mich.
Federal Tool Corp., 413 N. Leavitt St., Chicago, Ill.
Knu-Vise, Incorporated, 16841 Hamilton Ave., Highland Park, Michigan.
Star Machine & Tool Co., 9320 Woodland Ave., Cleveland, Ohio.
Variety Machine & Stamping Co., The, 12695 Elmwood Ave., Cleveland, Ohio.

STAMPS—Steel
AcromarK Company, The, (H. O. Bates), 261 North Broad Street, Elizabeth, N. J.

STEEL—Alloy
Columbia Tool Steel Co., 410 East 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1260-1264 West Fourth Street, Cleveland, Ohio.
Forging and Casting Corp., Ferndale (Detroit), Mich.
Jessop Steel Co., 610 Green St., Washington, Pa.
Wheelock-Lovejoy & Co., Inc., 130 Sidney St., Cambridge, Mass.

STEEL—Carbon
Columbia Tool Steel Co., 410 East 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1260-1264 West Fourth Street, Cleveland, Ohio.
Jessop Steel Co., 610 Green St., Washington, Pa.

STEEL—Chromium
Darwin & Milner, Inc., 1260-1264 West Fourth Street, Cleveland, Ohio.

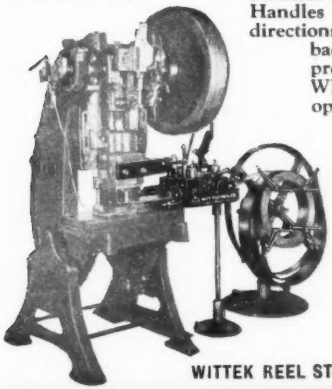
STEEL—"Cobalt"
Darwin & Milner, Inc., 1260-1264 West Fourth Street, Cleveland, Ohio.

STEEL—Graphitic
Timken Roller Bearing Co., Steel and Tubes Div., Canton, O.

INCREASE SCHEDULES — REDUCE COSTS!
SPECIFY WITTEK *Automatic* ROLL FEEDS

FOR ANY MAKE AND SIZE OF PUNCH PRESS

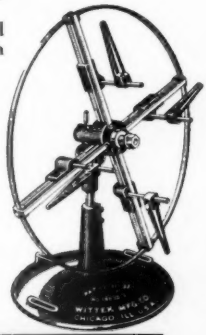
* Fast * Safe
* Accurate



WITTEK Automatic ROLL FEEDS — the feeds that have made automatic punch press operation practical. Can be installed on ANY make or size punch press without alteration. Handles ANY type coiled stock, and feeds in any of four directions: right to left, left to right, back to front, or front to back, in any length from 0" to 24" per press stroke.

WITTEK'S improved and simplified operating method does away with complicated moving parts, and insures rapid, smooth, safe, and accurate feeding under all conditions. Made in Single Roll, Double Roll (push-pull), and Compound types, with or without straighteners. WITTEK Automatic ROLL FEEDS save dies, minimize scrap, and maintenance costs.

Write for Catalog.



WITTEK REEL STANDS—A MODEL FOR EVERY JOB

WITTEK MANUFACTURING COMPANY
4305 W. 24th Place Chicago, Illinois, U. S. A.

PLASTICS MOLD DESIGNING

by Gordon B. Thayer

Nomenclature, Design Data, Mold Steels, Shrinkage Charts

Regular Edition, cloth bound, $2.50 per copy, postpaid

Shop Edition, with paper cover, $2.00 per copy, postpaid

Send remittances to The TOOL and DIE Journal
2460 Fairmount Blvd., Cleveland, O.

STEEL—High Speed
Ajax Steel & Forge Co., 205 Adair St., Detroit, Mich.
Columbia Tool Steel Co., 410 East 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1260-1264 West Fourth Street, Cleveland, Ohio.
Forging and Casting Corp., Ferndale (Detroit), Mich.
Jessop Steel Co., 610 Green St., Washington, Pa.

STEEL—Hobbing
Jessop Steel Co., 610 Green St., Washington, Pa.

STEEL—Tool & Die
Columbia Tool Steel Co., 410 E. 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1260-1264 West Fourth Street, Cleveland, Ohio.
Forging and Casting Corp., Ferndale (Detroit), Mich.
Jessop Steel Co., 610 Green St., Washington, Pa.
Wheelock-Lovejoy & Co., Inc., 130 Sidney St., Cambridge, Mass.

STEEL PLATE—Ground
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.

STEEL PLATE—Rough or Machined Torch Cut Shapes
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.

STEEL TREATING—Hardening
Lakeside Steel Improvement Co., 5418 Lakeside Ave., Cleveland, Ohio.

SURFACE PLATES
Challenge Machinery Co., Grand Haven, Mich.
Delta Mfg. Co., 640 E. Vienna Ave., Milwaukee, Wis.

TAP EXTENSIONS
Allen Mfg. Co., Hartford, Conn.

TAP EXTRACTOR
The Walton Co., 88 Allyn St., Hartford, Conn.

TAPPER—Precision
The Viking Tool & Machine Corp., 6 Main St., Belleville, N. J.

TOOL STEEL
Jessop Steel Co., 610 Green St., Washington, Pa.

TOOLS—Precision, Diemakers
Lufkin Rule Co., Saginaw, Mich.
L. S. Starrett Co., Athol, Mass.

TOOLS AND DIES—Carboloy
Kiffer Tool & Die Co., 5601 Tillman Ave., Cleveland, Ohio.

TOOLS—Carbide Tipped
Ex-Cell-O Corporation, 1206 Oakman Blvd., Detroit, Mich.
McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.

TOOL CHESTS
Gerstner Tool Chests, 56 Columbia St., Dayton, Ohio.

TUBING—Tool Steel
Bissett Steel Co., The., 947 E. 67th St., Cleveland, Ohio.

TYPE HOLDER
AcromarK Company, The. (H. O. Bates), 261 North Broad Street, Elizabeth, N. J.

WELDING
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

WELDING PLIERS
Knu-Vise, Incorporated, 16841 Hamilton Ave., Highland Park, Michigan.

WELDING RODS
Darwin & Milner, Inc., 1260-1264 West Fourth Street, Cleveland, Ohio.

WRENCH SETS
Allen Mfg. Co., Hartford, Conn.

Precision and General Machine Work

Tools Dies Gages Jigs
Special Machines Fixtures

PLANER WORK AND SCREW MACHINE PRODUCTS

Bar Capacities 1″ to 2½″ Diameter
(Warner & Swasey No. 2 and 2-A Turret Lathes)

Brake Dies
Boring Mill **Experimental Work**

DELIVERIES TO MEET SPECIAL DEMANDS

Phone GArfield 2060

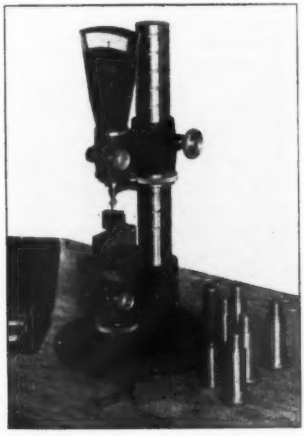
STAR MACHINE & TOOL COMPANY

9320 WOODLAND AVE. **CLEVELAND, OHIO**

Detroit Representative:
J. O. Stephenson **2618 Fourth Ave., Detroit, Mich.** **CAdillac 7261**

New Scherr Comparitol Speeds Precision Measuring

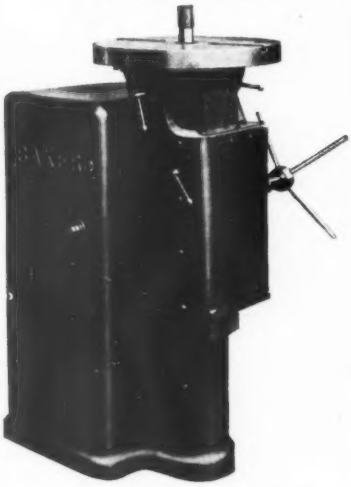
THE Comparitol is a new measuring instrument which operates on a new patented principle whereby precision measuring for inspection or any other purpose is speeded up to a marked degree. The mechanism consists of only two moving parts, the vertical spindle which carries the compact feeler point and the horizontal beam carrying the indicating hand. The patented principle is that of a stationary knife edge supporting the horizontal beam and a second knife edge contacting the horizontal beam on the upper side. The model shown in the illustration will be exhibited at the Machine and Tool Progress Exhibition along with the new Ultra-Chex Inspectoset which consists of 34 precision length measuring standards and will produce all combinations in steps of 1/10000 inch from .300 inch to 8 inch. Reed Micrometers and the new GS Dial Test Indicator with its exclusive ball joint back will also be on display.



An entirely new Scherr product is the Magni-Ray, a wide-field illuminated magnifier developed for extreme inspection. Actual machining operations may be observed through the magnifier, which is removable from its stand. There are two models, one with a highly specialized

(Continued on next Page)

Save Valuable Tool, Gage and Die Making *Time*
by using
BAKER
Contour Grinder



TOOL ROOMS AND DIE SHOPS WILL RECOGNIZE THESE NUMEROUS ADVANTAGES:

Convenient working height, complete visibility.
Vertical spindle mounted on large precision anti-friction bearings. Three speeds from Vee Belt drive.
Cam actuated reciprocating action, which can be disengaged when dressing the wheels.
Well ribbed 18" table with T-slot to front and rear. Mounted to provide angles for grinding of angular relief in dies, etc.
Wheels quickly interchangeable and held securely.
Quick acting capstan control of table slide.
Assembly protected against grindings and dirt.

For full details, write today for Contour Grinder Folder

BAKER BROS., INC.
TOLEDO OHIO

Columbia
TOOL STEEL

TIME SAVING—

Columbia Sales-Service men are now available to help you check:

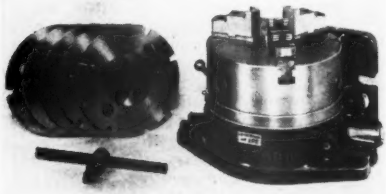
1. **Tool steel on hand and needed;**
2. **Applications;**
3. **Heat treatments;**
4. **Job set-up and output.**

Say the word and they will be on the job.

It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY
ARTHUR T. CLARAGE, PRESIDENT
810 EAST 14TH STREET - CHICAGO HEIGHTS, ILL.

Set-Up Time
REDUCED



The Hartford "Super-Spacer", by drastically reducing set-up time, saves time of your key men, adds to time available for actual operations and increases production. Speeds and feeds are limited only by the capacity of the holding means and the power of the machine.

Send for illustrated circular.

THE HARTFORD SPECIAL MACHINERY CO.
281 Homestead Avenue
HARTFORD CONNECTICUT

The Brady Magni-Lite is Aid to Accuracy; Speeds Inspection

THE Magni-Lite combines illumination with undistorted magnification in one instrument. It has many uses, among them inspection of parts and products, the observation of manufacturing processes and work in progress.

In operation the Magni-Lite concentrates daylight rays directly upon the object, which the operator then is able to view through a powerful magnifying lens. A minimum of eye-fatigue results and production or inspection, as the case may be, is greatly facilitated and accuracy more easily attained.

All Magni-Lite models may be had in either hand units, stand units or fitted for attachment to special equipment. Complete adjustability to any focus and all positions is assured through ball joint attachments and slides.

Particular value of the Magni-Lite is being experienced by tool and die makers for checking layouts for precision dies, molds, jigs and gages, also for adjusting and reading sliding vernier calipers and height gages; for the accurate setting of Bevel protractors.

A descriptive circular illustrating numerous uses of Brady Day-Lites may be had by writing Mizzy, Inc., Department TD, 105 E. 16th St., New York, N. Y.

Storage for Small Tools and Parts

Circular with detail dimensions and illustrations of steel revolving bins, counters and shelves. Keep items visible and instantly available. Make more efficient layouts for tool an stock rooms. Reduce required floor space by 50%. Write for circular 138TD to Universal Fixture Corporation, 135 West 23rd Street, N. Y., N. Y.

New Scherr Comparitol

(Continued from Page 75)

acromatic lens which has a magnification field of two full inches plus power of magnification of 1½".

All of the above mentioned precision measuring and inspection devices are products of the George Scherr Company, Inc., and descriptive circular may be had by writing the company at 128-B Lafayette St., N. Y., N. Y.

New Ex-Cell-O Bulletin

TO describe this new Ex-Cell-O Bulletin is to list a group of Industry's most vital precision machines, tools and accessories. In the Bulletin production men are made acquainted with Ex-Cell-O Thread Grinders; Standard Boring and Facing Machines; Three-Way and Cylinder (1 to 8) Boring Machines and a Center Lapping Machine. Hydraulic Power Units, Diesel Fuel Injection Pumps and Motorized Grinder Spindles, both in-built and belt driven, are of interest to builders of standard and special machines and equipment. For use in tool rooms, die and mold shops, there are Carbide Tool Grinders, Drill Jig Bushings, and for volume machining there are Continental Cutting Tools and Counterbores, Broaches and Ex-Cell-O Carboloy Tools. The company's Precision Parts service is an outstanding development and includes expert engineering, machining and heat treating.

Write for Bulletins 11383T and 11281D to Ex-Cell-O Corporation 1206 Oakman Blvd., Detroit, Mich.

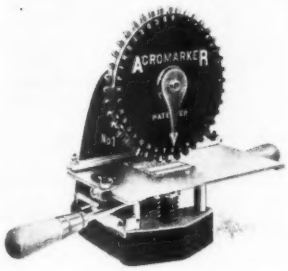
Tools with reputation

Chicago Rawhide Hammers and Mallets, manufactured from genuine Java Water Buffalo hide, are made by a firm with fifty years experience in producing quality products from rawhide. These tools make pounding safe on easily damaged surfaces. They are enduring. They are accurate. Rawhide does not "mushroom", crack or crumble. Even in unskilled hands they are safe because rawhide, tooled, compressed and tightly rolled, has resilience which cushions hard blows.

- **Chicago Rawhide Hammers are made with malleable heads and replaceable faces. Mallets are made in a dozen sizes to meet every requirement.**

CHICAGO Rawhide MFG. CO.
1280 ELSTON AVE · CHICAGO · U·S·A·

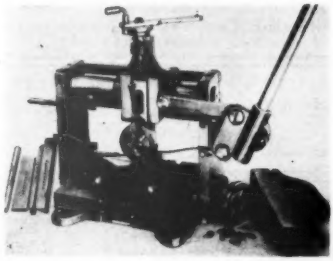
FAST Marking of National Defense Parts



The ACROMARKER

Stamps name plates, gages, tools, parts of steel and other metals, plastics, fibre and other materials.
Wheel takes 40 replaceable dies 1/32" to 3/16". The No. 1 AcromarkeR, illustrated, has a stamping area 5" x 3", will take name plate 9" x 5" x 5/8" thick.
Three sizes, all have patented automatic advance clutch, table lock for line adjustment and heavy screw pressure for thickness adjustment.

The No. 9 Round and Flat Marking Machine—
Now in use for marking aircraft parts, is adaptable to marking names, specification numbers and other information into a variety of shapes and sizes. A flat die impresses the mark as round pieces are rolled, or flat parts are marked with a roller die. Takes parts up to 10" x 4". Steel type or solid lettering dies are quickly interchangeable.



Literature on request

The ACROMARK Corporation
261 No. Broad St. Elizabeth, N. J.

Tool · Die · Machine CONTRACT SHOPS

Modern facilities for every type of designing and building service.

Hartford, Connecticut

***HARTFORD SPECIAL MACHY. CO.**
304 Homestead Avenue
SPECIAL MACHINES
Gears—Cams—Precision Specialties

Belleville, Illinois

DRESEL-BETZ COMPANY
Belleville, Ill.
Designers and Manufacturers of
TOOLS, DIES, JIGS
FIXTURES, METAL STAMPINGS

Chicago, Illinois

***FEDERAL TOOL CORPORATION**
412 North Leavitt St. HAYmarket 2150
Tools Dies Jigs Fixtures
Stampings Special Machinery

Leominster, Massachusetts

GRIMES & HARRIS, INC.
92 Pleasant St. Leominster, Mass.
Equipped to Build
TOOLS—JIGS—FIXTURES

Detroit, Michigan

ACE TOOL & DIE COMPANY
3801 Trenton Ave. Oregon 1008
TOOLS and DIES
Special Machinery

DAVIS TOOL & ENGINEERING COMPANY
6481 Epworth Blvd. TYler 46070
TOOLS and DIES
Special Machinery
Sheet Metal
Stampings and Assemblies

***ENTERPRISE MACHINE PARTS CORP.**
Jerome Ave. at McNichols Rd. E. TOwnsend 8-9643
PRODUCTION MACHINE REPAIR PARTS
Motor Drives, Gears, Worms, Tools, Fixtures
Machine Overhaul Specialists

***KOESTLIN TOOL & DIE CORPORATION**
3605 Humboldt Ave. Detroit, Mich.
Manufacturers
Sheet Metal Dies "Grindrite" Die Grinders

MAJESTIC TOOL & MFG. COMPANY
2948 Woodbridge St., East FItzroy 1011
Manufacturers
General line of Tool and Die Work, Tool Details, Parker High Speed Grinding Spindles

***See larger display advertisement also.**

Detroit (Cont'd)

NORTHEASTERN TOOL & DIE CO.
3125 E. Larned St. FItzroy 1275
Specialists in the Designing and Building of Progressive Dies
Dies—Tools—Special Machinery

ROBBINS ENGINEERING COMPANY
637 Mt. Elliott Ave. FItzroy 4740
Designers and Manufacturers
Tools, Dies, Jigs, Fixtures
Special Machinery and Experimental Work

ROYAL OAK TOOL & MACHINE CO.
621 E. Fourth St., Royal Oak, Mich. ELmhurst 6580
Manufacturers of
Tools, Dies, Jigs, Fixtures. Special Machinery and Designing. Hoch Self-Centering Cylinder Reamers

Belleville, New Jersey

***THE VIKING TOOL & MACH. CORP.**
6 Main St. Belleville, N. J.
TOOLS—DIES—JIGS—FIXTURES—MOLDS
GAGES—MACHINES—STAMPINGS
SPECIALTIES

Jamestown, N. Y.

RANE TOOL CO., Inc.
17 Ross St. Phone 5934
Specialists In
BLANKING, FORMING and DRAWING DIES

New York City, N. Y.

CONRAD & MOSER
8 East 12th St. New York City
Machine Tools & Molds, Parts & Machines
Aluminum Cast Parts—Aluminum Sheet
Formed Housings

Cleveland, Ohio

BARTH STAMPING & MACHINE WORKS
Die & Tool Makers
W. 34 & Denison Fl. 8411

***THE BUNELL MACHINE & TOOL CO.**
1620 East 24th St. PRospect 2681
DIES—JIGS—FIXTURES
Gages—Models
SPECIAL MACHINERY
Swiss Jig Boring
Screw Machine Products

Cleveland (Cont'd)

CLEVELAND UNIVERSAL JIG COMPANY
13404 St. Clair Ave. MUlberry 2600
Designers and Builders
Jigs & Fixtures Special Machines
Production Engineering
COMPLETE PLANT ROUTING and TOOLING

THE DENNING MANUFACTURING COMPANY
1775-81 East 87th St. CEdar 0801
Designers and Builders
HIGH GRADE DIES

GENERAL DIE & TOOL COMPANY
2067 W. 55th St. WOodbine 4736
Dies Tools Jigs Fixtures
Light Stampings Manufacturing Special Machinery

HAHN MANUFACTURING COMPANY
5332 Hamilton Ave. ENdicott 2205
Modern equipped shop for building of
MEDIUM AND LARGE
DIES, TOOLS, SPECIAL MACHINERY
Equipment includes:
3" and 5" spindle Horizontal Boring Mills
Large planers Vertical Mill

THE INDUSTRIAL MACHINE CO.
1436 East 47th Street Founded in 1903
Builders of Special Machinery
GENERAL MACHINE WORK

KIFFER TOOL & DIE CO.
5601 Tillman Ave. WOodbine 2440-2441
Manufacturers Special Machinery
Tools, Dies, Jigs, Fixtures, Tungsten Carbide Tools
SWISS JIG BORING

THE McKINNEY TOOL & MANUFACTURING CO.
1688 Arabella Rd. KEnmore 1681
Designers and Builders
Jigs—Fixtures, Dies, Special Machinery
Swiss Jig Boring General Machine Work

OHIO TOOL COMPANY
3160 West 106th St. CLearwater 3200
Designers and Builders
SHEET METAL DIES, TOOLS, SPECIAL MACHINERY, DIE CASTING DIES
RUBBER MOULDS
•
Modern Facilities
150-Man Shop

NOBLE & STANTON
21011 Gardenview Ave. Montrose 34-J
Maple Heights, Bedford, Ohio
EXPERIMENTAL MACHINISTS
SPECIALISTS IN SMALL AND MEDIUM DIES
TOOLS—DIES—JIGS—FIXTURES

THE PARAMOUNT TOOL CO.
1392-98 East 43rd St. ENdicott 2220
JIGS, FIXTURES, DIES
Experimental Work

The PHOENIX MACHINE COMPANY
2711 Church Ave. CHerry 1048
CONTRACT GRINDING
BORING and PLANING
Manufacturers of
LESTER-PHOENIX DIE CASTING AND PLASTIC MOLDING MACHINES

A. P. SCHRANER & COMPANY
3338 Payne Ave. HEnderson 8644
EXTERNAL CYLINDRICAL LAPPING MACHINES
Special Machinery
TOOLS, DIES, JIGS, FIXTURES

***THE SOMMER & ADAMS CO.**
18511 Euclid Ave. KEnmore 0810-0811
DESIGNERS AND BUILDERS
Special Machinery
TOOLS, JIGS and FIXTURES

***STAR MACHINE & TOOL COMPANY**
9320 Woodland Ave. GArfield 2060
Designers and Builders
Dies, Jigs, Fixtures, Gages, Special Machinery
Jig Boring—Planer Equipment

TOOLS & GAGES, Inc.
3106 East 63rd St. MIchigan 7230
"Let us be your tool room."
DESIGNERS AND BUILDERS
Tools, Gages, Dies, Jigs, Fixtures
Special Machinery
SWISS JIG BORING
DIE CASTING DIES

THE VARIETY MACHINE & STAMPING COMPANY
12695 Elmwood Ave. LAkewood 8433
Designers and Manufacturers
Dies, Metal Stampings 250 tons capacity

Hamilton, Ohio

***THE HAMILTON TOOL COMPANY**
220-222 North B Street
Designers and Builders of
Tools, Dies, Jigs, Fixtures, Special Machinery
The Hamilton Portable Elevating Table

*See larger display advertisement also.

SHARPLY DEFINED *Scribed Lines*

Micro *Supreme*

LAY-OUT DYE

Manufactured by

MICHIGAN CHROME & CHEMICAL CO.

6350 E. Jefferson Ave., Detroit

Be Sure to Take Advantage of This Special

TRIAL OFFER

A handy five-ounce Combination Brush-in Can . . . ideal for shop use and for trial purposes . . . for only

60c

In hundreds of shops, ILLINOIS Die Filing Machines are turning out accurate work many years after their original purchase. Experienced diemakers who have operated various types of filing machines know that an ILLINOIS is quality built throughout and will stand up longer, while producing more accurate work. Write for descriptive literature today.

ILLINOIS TOOL WORKS
2503 N. Keeler Ave. Chicago, Illinois

ILLINOIS DIE FILING MACHINE

A Portable Brinell Meter

A circular describing this portable apparatus for the accurate determination of the hardness and tensile strength of metals and metal products, independent of their dimensions, shape and location. No cutting of specimens is required. The instrument is rugged, cannot get out of order, and is always ready for use. Complete outfit costs $55.00. Write Louis C. Eitzen Co., 17 W. 60th St., N. Y., N. Y.

Allegheny Ludlum Expands West Coast Service

W. F. Detwiler, Chairman of the Board of Allegheny Ludlum Steel Corporation, announces the completion and opening of the company's new, modern warehouse and offices at 4915 Pacific Boulevard, Los Angeles, California, which are designed to give complete and prompt service to the corporation's many customers for special steels on the West Coast.

5000 Shapes and Sizes *Grobet Swiss Files*

Write for Catalog YF

The most complete catalog of its kind. Lists 5000 different shapes, sizes and cuts of GROBET Precision Swiss files.

Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability.

Ask also for catalog YM on Files for Filing Machines; catalog YR on Rotary Files and Diesinkers' Burs.

GROBET FILE CORP. of AMERICA • 3 PARK PLACE NEW YORK, N.Y.

Increase Steel Treating Capacity 100 Per Cent

The George H. Porter Steel Treating Company of Cleveland, Ohio, is completing a plant addition which, with new equipment now being installed, will increase capacity 100%. Improvements include automatic handling and quenching of bar stock. Both gas and oil heated furnaces are operated to provide the kind of treatment best suited to each type. The company is operating 12 furnaces for heat treating of tools, of which it has made a specialty.

Dust-Proof Gravity Oiler

A NEW, visible, unbreakable, dust-proof Oiler intended for all applications of gravity feed type oilers where the DUST-PROOF feature is desirable has just been announced by the Trico Fuse Mfg. Co., Milwaukee, Wis.

A unique feature is the REMOVABLE FILTER that can be extracted for cleaning in less than five seconds without tools or waste of time. If it is important that dust and dirt shall not reach the bearing, it is likewise important that the filter be easily extracted for cleaning without disassembling the oiler to get at the filter. The dangers of neglect and clogging, which result in costly failures, are eliminated.

The Oiler is mounted at the top of the part to be lubricated and any predetermined number of drops of oil per minute can be obtained by a simple adjustment of the needle valve. The shut-off lever at the top, when in a vertical position, as shown, feeds oil, and when tilted to the side, stops the flow.

The dome is streamlined and hides the ratchet lever mechanism. The heavy brass tube houses the fine needle valve that is extremely accurate. The sight fitting is streamlined with wrench-grip at top.

Made in four styles: With removable filter; with removable filter and vent-tube; with removable filter and drain cock; with removable filter, vent-tube, and drain cock.

All styles are available in one, two, four and eight-ounce capacities.

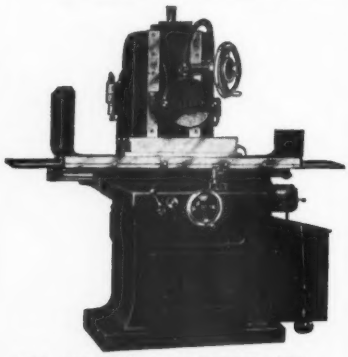
Complete descriptive bulletin on the Trico Dust-Proof Gravity Oiler is available. Write Trico Fuse Mfg. Co., 2846 N. 5th St., Milwaukee, Wis.

HERE ARE THE DRILL BUSHINGS THAT CUT TOOL COSTS

The Super-finished bores of Universal drill bushings insure accuracy, unexcelled wearing qualities and longer tool life. All standard sizes available. Write for facts.

UNIVERSAL
Engineering Company
Frankenmuth, Mich.

Speed and
Precision *Combined*



IN GRAND RAPIDS HYDRAULIC FEED SURFACE GRINDERS DESCRIBED IN
BULLETIN GL-100

Gallmeyer & Livingston Co.
304 Straight Ave. S. W. Grand Rapids, Mich.

"Tooling Up for Plastics"

THIS is the title of a new catalog of Carpenter Mold, Hob and Tool Steels. Beginning with a frank presentation of the plastic mold maker's problems, it is appropriately pointed out that "Even under ideal conditions, the design of the molded article is usually a compromise between engineering, artistic, sales, and profit requirements." The problem of the mold maker then is to turn out a mold which effectively meets with all of these requirements. The mold will be expected to maintain production without "sticking of the part . . . . sinking, spalling of sharp corners or edges" and generally maintain quality so that inspection will not show high loss ratio.

A significant statement, one which not only plastic mold makers will do well to ponder but likewise all of those who are responsible for tooling of any kind is: "Into this mold you may have to pour several hundred dollars' worth of highly skilled labor—an investment that can be jeopardized in ten seconds by failure of the steel."

The article continues by emphasizing the necessity for using specially developed mold steels if uniformly dependable and satisfactory results are to be assured. The characteristics of Carpenter's several brands of mold and tool steels are next described in detail, and their qualifications fitted into the different requirements imposed by various materials and processes. Heat treatment is also carefully set forth in detail.

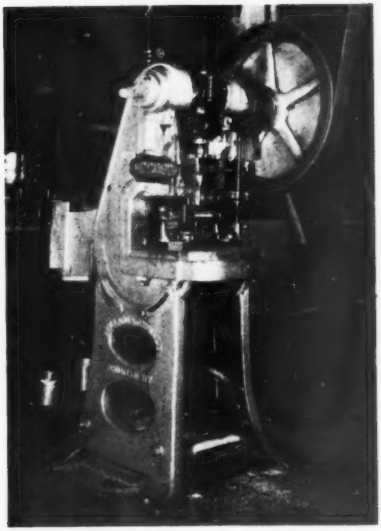
Sections of the book are devoted to Carpenter Stainless Steels and Tool Steels for Hobs. There is a Hob Steel Selector and a descriptive article on Tool Steels for Fabricating Plastics. One of the interesting chapters in the catalog is entitled "Questions Commonly Asked About Mold Steels". Several of them introduce the fundamentals of plastic mold making while others are interesting from the standpoint of the plastic industry's progress and development. All are valuable for men who have the responsibility of selecting plastic mold steels.

Send for your copy of "Tooling Up for Plastics" by writing to F. R. Palmer, Vice-President, The Carpenter Steel Company, Reading, Pennsylvania.

A Press Building Tradition by and for Die Men

APPROXIMATELY fifty years ago Mr. Herman Osswald and Mr. Celestine Vieillard were die makers for one of the largest press manufacturers. They realized the need for a better press to give longer life to the dies and allow for a lower maintenance cost for the machine. To fulfill this need came the first V & O press which pioneered many of the outstanding features of press design in general use today. Among these were the long slide, eccentric shaft, and overhanging bearings.

These men were motivated by the fact that it is not uncommon in the general use of presses to use dies that are much more expensive than the machine itself.



The first V & O Press which still operates daily in a nationally known brush manufacturer's plant as 50 years of evidence of correctness of design and quality of construction.

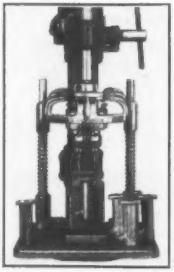
They considered then, as the company they founded still does, that it was sound judgment to build a press that would protect the die to the fullest extent. To do this, Osswald and Vieillard designed a press made of better materials and

(Continued on Page 84)

LINCO *Two Spindle*
Adjustable Drill Head

Also Adaptable for Tapping

Drills two holes at once, made in several sizes, drill centers ½" to 6", speeds up to 3600 RPM, capacity drills 0" to ⅝". Total weight of small head, with aluminum gear case, only 9½ lbs. Equipped with roller and ball thrust bearings. Especially engineered for Canedy Otto, Demco No. 15 and similar drill presses—also suitable for use on larger drill presses.



Descriptive Bulletin
Sent on request

LINDERME
Machine & Tool Company
12250 Coyle Ave.
DETROIT, MICHIGAN

Remove
BROKEN TAPS

Quickly
Insert WALTON Tap Extractor and back out broken piece. No annealing—no drilling.

Easily
Tap Extractor and Tap Wrench are only tools needed.

Safely
Threads are not damaged. Not necessary to tap oversize after broken tap is removed.

Write for Folder 132

THE WALTON CO.
88 Allyn Street Hartford, Conn.

LUFKIN CHROME CLAD

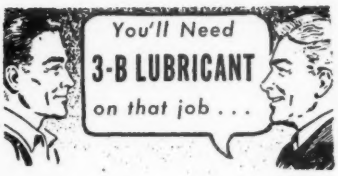
Jet black markings stand out prominently against the satin chrome surface that won't rust, crack, chip, or peel. See the new Chrome Clad Steel Tapes at your dealers.

WRITE FOR FREE CATALOG

LUFKIN

SAGINAW, MICH. New York City

TAPES—RULES—PRECISION TOOLS



3B is literally the "last word" on those very difficult tapping and cutting operations on hardened and toughened steels.

3B gives longer tool life—better threads—cleaner holes—than *any other lubricant.*

We'll send you a free sample on request.

WAYNE

CHEMICAL PRODUCTS CO.

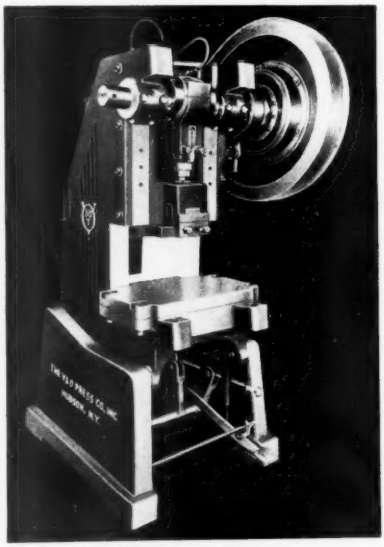
Mfrs. Protex Non-Rust Oils
Aqua Sol Grinding Compound

9425 Copeland Avenue
DETROIT, MICH.

Press Building Tradition

(Continued from Page 83)

constructed to give greater rigidity and more accurate and positive alignment of punch and die. This construction made it possible to achieve better fits and maintain closer tolerances. That their idea and practices have proven successful is illustrated by the fact that the first V & O press ever marketed is still in daily operation in the plant of a nationally known brush manufacturer after fifty years of continuous service.



New Model 30 T with friction clutch, overload relief and numerous additional features of outstanding value.

It has been the expressed policy of the Company that if, by the use of a better press, an intricate and costly blanking die will produce 50% more blanks, a few extra dollars spent on the initial cost of the press certainly represent a sound investment. Therefore, V & O presses, even though they cost more than ordinary presses, prove to be far less expensive in the long run according to the Company's records.

Machines generally outstanding in appearance and in operation also provide an incentive to the operator to take bet-

(Continued on Page 87)

EXTRA SPEED and POWER in HAND GRINDERS

AIR GRINDER
50,000 R.P.M.—¼ H.P.

Every shop needs at least one *good* grinder. With an Onsrud MD-1 you are assured of the best. Weighs less than 2 lbs. Handles with greatest ease for heavy grinding or fine touch-up. Impulse reaction type rotor. Full automatic lubrication. Cannot heat up or burn out by stalling in a cut. Write for circular MD-1.

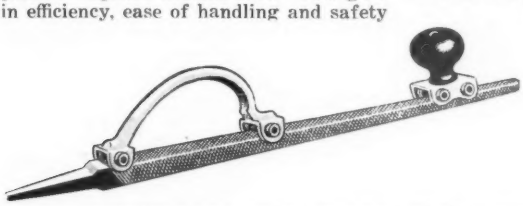
Send For 10-Day FREE TRIAL OFFER

ONSRUD MACHINE WORKS, Inc.
3914 Palmer Street
CHICAGO, ILLINOIS

Die-Craft File Handles and Holders

THE Die-Craft line of Surface File Handles and Front End Holders designed for easy holding and directing and application of pressure to the front of the file are detachable and will hold the file tight under all conditions. Pressure is applied with Socket Head Screws having an adjusting range of ¼".

Handles and Front End Holders for all tool room files are included in the line. The illustration shows a Die-Craft File Handle and Front End Holder applied to square bastard file. The gain in efficiency, ease of handling and safety makes better file performance possible.



A descriptive circular on the Die-Craft File Handle and Front End Holders will be sent on request. Address Die-Craft, Inc., 34851 Michigan Ave., Wayne, Mich.

Meehanite Appoints English Manufacturer

The Meehanite Metal Corporation, Pittsburgh, Pa., announces that through its London branch, The International Meehanite Metal Company, Ltd., Meehanite manufacturing rights have been granted to Qualcast Limited, Victory Road, Derby, England. This company is one of the leading foundries in England and manufactures a wide variety of agricultural equipment parts and miscellaneous castings.

PROFIT by LAKESIDE'S EXPERIENCE

Our Defense Program is gaining momentum and more buyers must take advantage of a source keyed for Mass Production at Top Speed, and where Trial and Error methods are eliminated.
Our modern production methods and new equipment insure the fastest possible processing of Defense orders.

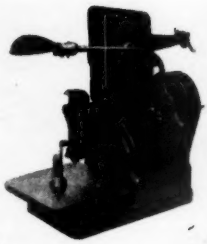
Every type of heat treating is available—
Flame Hardening—Cyaniding—Carburizing—Chapmanizing—
Nitriding—Heat Treating and Bar Straightening.

The LAKESIDE STEEL IMPROVEMENT CO.
5418 Lakeside Ave. 24 Hour Service Call HEnderson 9100 Cleveland, O.

New DUPLEX Die and Punch Filing Machine

the exclusive double-purpose tool with adjustable stroke from 0 to 1½". The Duplex files dies in the conventional way, and punches with heels or flanges from above with work located on table below. Fully enclosed two-speed motor drive.

See our Exhibit in Booth 206 at ASTE Show, Convention Hall, Detroit, March 25-29



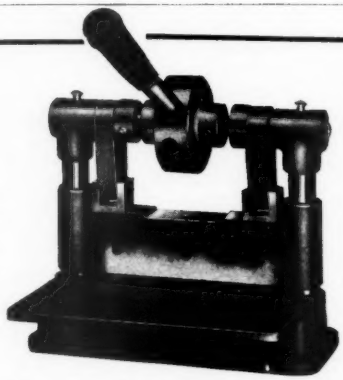
MARBURG BROS., INC.
88-92 West St. New York

New 22,000 RPM Hand Grinder

A NEW Dumore High Speed Hand Grinder known as the No. 18, illustrated here, has an idling speed of 22,000 RPM. Nevertheless it weighs only 4¼ lbs., and the maximum temperature rise is but sixteen degrees centigrade. Its overall length is 11½ inches and it registers a diameter of only 3 inches at the motor. This makes it unusually compact and well balanced. Either an ⅛ inch or ¼ inch capacity chuck is available, the motor being a 1/7 h.p. universal type to be operated on either alternating or direct current. An important feature of the grinder is the spun glass air filter which prevents foreign particles from damaging the motor parts.

A circular is available. Write the Dumore Company, Department 371A, Racine, Wisconsin.

"MICRO" *DIE DUPLICATING* SHEAR



A great variety of small metal parts can be made cheaper and quicker without blanking and forming dies with "Micro" Machines. For instance, the "Micro" Die Duplicating Shear shapes metal pieces to die accuracy without dies, shears stock sheets, etc. Accurate to .001", shearing width 6".

See full line "Micro" Machines at A.S.T.E. Machine and Tool Progress Exhibition, Booth 408, Detroit.

Write for prices and circular, "Metal Duplicating without Dies."

O'NEIL-IRWIN MFG. CO., 316 8th Ave. So., Minneapolis, Minn.

Press Building Tradition

(Continued from Page 84)

ter care of them. Every man has a respect for quality. When that quality is directed toward more safety factors and easier control in operation, it tends to affect both the attitude and the ability of the operator to produce a better product.

For more than fifty years, the tradition of a press built by and for die men has been maintained. With the use of more modern equipment the standards of performance and die protection set by our first press have been improved. The new T line, brought out to supplement the present line with machines of higher productivity, has been born out of that tradition. It epitomizes the pioneer tradition which prompted the revolutionary design of Mr. Osswald and Mr. Vieillard half a century ago.

Greater speeds are made possible with the use of a newly designed instantaneous self-energizing ball-actuated friction clutch, affording an infinite number of engaging points, over-load relief, smoother action and backing up feature. A directional panel is provided for centralized control of the built-in clutch lock, single stroke clutch, and fully releasable or constant self-aligning band brake. They are designed with a higher safety factor for greater rigidity, a more compact motor drive arrangement, more bed area, wider and heavier flanged slide, more slide adjustment, safer and easier inclining mechanism (operated from in front of the press), easier treadle action, treadle guard, one-shot lubrication, improved loop type safety guard, ball bearing mounted web type flywheel and arranged for tie rods with spacing tubes. These machines are heavier and sturdier, which will result in longer life to the dies and lower maintenance cost to the machine.

They represent our current, but we trust not our last, contribution toward better and more efficient presses.

Paint in Stick Form

Use like a pencil. The "Paintcil"—two types—marks metals that are hot and surfaces that are cold. Markings are permanent even though exposed indefinitely to the elements. Packed 12 and 36 sticks to the package. For Circular CL and prices, write Louis C. Eitzen Co., 17 W. 60th St., N. Y., N. Y.

Foredom Built-for-Service
FLEXIBLE SHAFT TOOLS

INDISPENSABLE in TOOL, DIE, MOLD and PATTERN SHOPS—
Yet INEXPENSIVE ENOUGH for even the SMALLEST SHOPS!

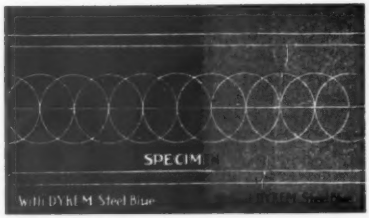
Use the **Foredom Flexible Shaft Tools** for removing burrs, corrosion and high spots, grinding, finishing, and touching up dies, cutters, tools, etc.; sharpening, identification marking, milling, slotting, cutting oil grooves, under-cutting, routing and countless other tasks.

Bench and suspension models available, some with pencil-size handpieces. Model illustrated is No. 340, priced at $39.50—with either foot or hand-operated speed control.

SEND FOR COMPLETE CATALOG T

Builders of Quality Tools Since 1922

FOREDOM ELECTRIC COMPANY, Dept. 224
27 Park Place New York, N. Y.



DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates

Simply brush on; ready for the layout in a few minutes. The dark blue background makes the layout lines show up in a sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY
2201 N. 11th STREET ST. LOUIS, MO.

Mold Building Equipment and Machinery

(Continued from Page 42)

be used on a single steam plate, it is very important to have the distance from the back of the cavity or force to the parting line the same for all impressions. The dimension is not usually very important as long as it is the same for each impression.

Round forces and cavities are ground on a cylindrical grinder after hardening. This work calls for precision and working to the exact dimensions called for by the designer. In general, all molding portions of plastics molds must be accurately sized to the dimension specified, but other parts need not be held as closely as long as the mold can be assembled. It is best not to insist on outside dimensions being held, as stock sizes may be slightly different from those specified, and still the mold will be satisfactory. Errors do occur in the tool maker's work, and if a piece can be saved without destroying the character of the mold, other parts can be revised slightly to allow the use of the incorrect piece.

Band saws can be used to saw out templates for plastics molds and gages, although some gages are milled in order to obtain accurate curves and centers. While many mold parts are not adapted to band sawing, the method is very useful and economical when it can be used.

Special Tools

When the contours of a mold cavity cannot be readily approximated in mathematical curves and when the work is too large for hobbing the cavity is machined out on the duplicator. Sometimes the feed screws of the milling machine are used for accurately centering and swinging radii in the horizontal plane. When the work schedule of the duplicator department is overloaded a rough model or template may be used with the duplicator to machine the contour in the vertical plane.

Hobbing pressures approximate 100 tons per square inch, although this figure does not cover the wide range of pressures used. Intricate hobs which may have sharp corners will not take as much load as smooth, heavy hobs. Hobbing should proceed slowly and steadily to give the metal time to flow and flow uniformly. The pressure gage on the press will indicate the rate of flow. Experience of the operator is essential in judging proper operation; and he must know when to stop if pressure becomes too high for a given hob. The usual capacity for hobbing presses in mold sinking work is 1000 to 3000 tons. Pressure is supplied by oil, and the pump and controls are designed to give high and low pressures with slow and rapid traverse of the ram.

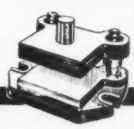
Molds are given their high polish by working over them with finer and finer cutting media. The rough machined mold is filed to an even, smooth contour before hardening. After hardening it is ground with various abrasives, both by hand and by flexible shaft machines. The correct practice is to remove the deepest scratches with the first grain, and then use a finer grain to remove the scratches left by the former abrasive. Usually there are no more than three or four steps in the grain sizes used. Abrasives are applied from a cloth backing, from a synthetic stone, or from a dry or oiled stick. Polishing machines consist of a stand to hold a small motor which operates a flexible shaft to which may be attached the polisher's favorite polishing brushes or blocks. Superfinishing as a polishing method has some applications, but the method unfortunately is not practical for intricate plastics molds, because of the space required to maneuver the reciprocating polishing heads.

(Continued on Page 90)

INTERCHANGEABLE BECAUSE
- Precision bored on master plates
- Precision assembled with cylinder squares

WRITE FOR CATALOG

DANNEMAN Precision DIE-SETS



F. C. DANNEMAN 203 LAFAYETTE ST., NEW YORK, N. Y.

NEED DESIGN SERVICE?

Let us do your surplus work—

The blending of specialized experience of five designers will give you the best—

Stamping, Forging and Die Casting Dies

Jigs and Fixtures

Gages and Cutting Tools

Automatic Machine Tool Layouts

Send specifications, sketches or part for quotation.

PRECISION TOOL DESIGN SERVICE
2935 E. 121 St. Cleveland, O.

Jessop Opens Detroit Office; Establish 2 New Warehouses

The Jessop Steel Company, Washington, Pa., announces the establishment of a new branch office and warehouse at Woodbridge and Walker Sts., Detroit, Mich. The warehouse carries complete stocks of tool steels, high speed steels, tool and spring steel sheets, stainless steels (hot rolled, cold drawn, and centerless ground), aircraft quality steels, drill rods, and other Jessop steels—in sheet, bar, and plate form. David Hanna, district manager, is in charge.

Jessop Steel Company has also recently established a new warehouse at 1433 Hamilton Ave., Cleveland, O., and has moved their Cleveland branch office to this address. The Cleveland warehouse carries stocks similar to those in Detroit. F. P. McGahan is district manager.

Kennametal-Tipped Gages

THE McKenna Metals Company announce that go and no-go gages tipped with Kennametal are now available for the accurate gaging of cylinders, tubing, and other parts where dimensions must be held close.

Kennametal is also used to advantage on other types of gages and instruments such as progressive plug gages, micrometers, etc. Further advantage of Kennametal when used on gages and micrometers, in addition to its wear-resistant quality, is the fact that it will not rust and therefore retains accuracy for a long period of time.

Complete information on Kennametal-tipped gages and micrometers will be furnished by manufacturer upon request. Address McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.

The *New* Aber
Curved Tooth
WOODRUFF KEYWAY CUTTER

"Doubled Production"

according to reports.

Many advantages over old-type keyway cutters:

More cutting edge
Gives shearing cut
Cuts 50% faster
More cuts per sharpening
Easy to sharpen

Full line standard sizes, round or square end shank, in stock. Special size cutters made to order.

Circular with prices, on request.

ABER ENGINEERING WORKS
1613 Flett Ave. Racine, Wisconsin

Hamilton Tool Co. in New Plant

J. E. Grove, secretary of The Hamilton Tool Co., announces that the entire plant has been moved to a new location at Ninth and Hanover Sts., Hamilton, O.

THE GEO. H. PORTER STEEL TREATING CO.

Tool Work Our Specialty

1271 East 55th St. Tel. HEnderson 6601 Cleveland, Ohio

Mold Building Equipment and Machinery

(Continued from Page 88)

Auxiliary Tools

When a template is to be made to fit a model, it is sawed from flat tool stock, and then filed on a filing machine to fit. This operation is a precision job.

Finishing touches are added to hardened molds by using hand grinders, either air or electrically operated. Hand grinding is not a good method for finishing a mold, but is a time-saver in case of unforeseen troubles. Files are available for use in these grinders and are useful for some work which might become too tedious for hand filing. Hand grinders are used to make the gates for injection molds during the tryout operation.

Special form tools for duplicating and end milling can be conveniently ground on the tool grinder. The screw holes for holding forces and cavities to their backing plates are usually tapped in the force or cavity before drilling the clearance hole in the plate. Socket head cap screws are used, and the clearance holes are not excessively large, so the screws can serve as dowels. They are usually sufficiently tight to prevent the cavity from shifting. This calls for straight holes in the backing plates and straight tapping. A hand tapper is frequently employed because its use insures true holes.

The range of sizes of holes for pins in plastics molds is practically unlimited. In lapping pin holes, it is almost necessary to make a lap for every job. For holes which are large enough, copper laps may be purchased which will cover a definite range in hole size. For small holes, the tool maker frequently uses a piece of drill rod in such cases, but the amount of metal that can be removed with accuracy is limited.

Abrasive stones are available for polishing and sharpening jobs. These stones come in various grades and shapes; shapes can be further varied by grinding the stone on the tool grinding wheel. Molds which become nicked and scratched in operation have to be stoned out and sometimes deep nicks are welded and then stoned. This operation is extremely slow and tedious, and it should be reduced as much as possible by machining close to size.

Corners and curves which cannot be cut out by end mills can be finished with hand files by the tool maker. The shapes and tooth sizes range widely. It is a slow expensive job to file a mold and the mold designer should strive to hand work as much as possible.

"Fills an Important Need in the industry"—a leading Custom Molder

PLASTICS MOLD DESIGNING

By Gordon B. Thayer, Plastics Design Engineer
General Industries Company

Fundamentals of modern mold design—based on extensive, sound shop practice. Contains the largest Nomenclature on plastics mold design, shrinkage charts, a section on Mold Steels and additional design data as well as the articles which have appeared serially.

All data shop tested, some material by as many as nine sources. Introduction by George K. Scribner, President, Boonton Molding Company.

Ready April 1st—Reserve your copy now.

Regular Edition, substantially bound in cloth, $2.50 per copy postpaid.

Apprentice or Shop Edition, with paper cover, $2.00 per copy postpaid

Send Reservations to THE TOOL and DIE JOURNAL
2460 Fairmount Blvd., Cleveland, O.

WHY NOT?

Why not give your tools the **best** of care by keeping them in a genuine Gerstner Chest?

Free Catalog upon request.

GERSTNER TOOL CHESTS
56 Columbia St. Dayton, Ohio

THE PRECISION UNIVERSAL TOOL HEAD
brings all adjustments under absolute micrometric control without stopping tool or machine.

In Jig Borer, Milling Machine or Boring Mill, it bores, faces, counterbores, turns outside diameters, mills flat surfaces and slots, undercuts, recesses, back faces and does an almost limitless range of "headache" jobs. Send for bulletins.

Removal Notice:
We are no longer located at Bridgeport, Conn.
Send all communications, inquiries and orders to

THE PRECISION TOOL COMPANY
P. O. Box 155, Brooklyn, New York
MAin 4-1064 Cable Address: "PRETOOL-NEWYORK"

Bench Shear for Die Duplicating Work

THE Micro Die Duplicating Shear is a precision unit designed for accurately trimming metal stampings for die duplicating work as well as shearing material to die duplicating sizes from stock sheets. Primarily it is intended to be used in conjunction with the Micro Bender and the Micro Bench Brake. When quantities of metal stampings are not sufficient to justify the making of blanking and forming dies, the Micro Shear will shape metal pieces to die accuracy—.001 inch. It will accommodate stock to a width of 6 inches.

The design of the Micro Shear permits the operator to have close observation of his work at all times. The hand operated lever provides him with a sensitive cutting control that is not possible to acquire with a heavy foot operated shear. It also gives him machine stability for accurate light shearing that cannot be duplicated with the thumb- and finger-operated hand shear. The working table can be drilled and tapped for precision gages for die substitute and semi-production work. It is made of steel plate and can be replaced from stock material whenever required.

Adjustments are provided for adjusting the clearance between shearing blades. Clearances may be set for shearing ordinary material to extremely close tolerances without buckling or knurling and for "hairline" shearing of the very lightest materials.

An interesting descriptive circular with instruction for use of Micro Benders, Shears and Brakes is available. Write O'Neil-Irwin Manufacturing Company, 316 Eighth Avenue S., Minneapolis, Minn., for Folder T.

A SHOP AID

DESIGNING FOR DIE CASTING—this 36-page and cover booklet gives a number of practical hints on designing for Zinc Alloy Die Casting. Each design detail is illustrated by a blueprint, in some cases both satisfactory and unsatisfactory designs are shown to emphasize the preferable design. A table of properties of the Zamak series of zinc alloys is given. Address The New Jersey Zinc Co., Front and Maiden Lane, New York, N. Y.

Light for "Better Seeing"

More Work — Better Work Per Man

Speed production, cut rejects, increase efficiency and morale by giving your workers adequate light **on the job** for better "seeing". Fostoria Localites solve the problem. Over one thousand machine, bench, table and overhead models. Write for catalog No. 25, today.

ENGINEERED fostoria LOCALITE

THE FOSTORIA PRESSED STEEL CORP. Fostoria, O.

Advertisers Index

Aber Engineering Works 89
Ace Tool and Die Co. 78
Acme Industrial Company 69
AcromarK Corporation, The 77
Ajax Steel & Forge Co. 70
Allegheny Ludlum Steel Corporation ....
Allen Manufacturing Company 61
American Swiss File & Tool Company ... 56
Armstrong-Blum Mfg. Co. .....Back Cover
Atlas Press Company 41

Baker Bros., Inc. 75
Barth Stamping & Machine Works 78
Bissett Steel Company 73
Blanchard Machine Company 16
Bokum Tool Co., Inc. .....
Boyar-Schultz Corporation 43
Builders Iron Foundry .....
Bunell Machine & Tool Company. 18 and 78

Carborundum Company, The 3
Cerro de Pasco Copper Corporation .....
Challenge Machinery Company .....
Chicago Rawhide Mfg. Co. 77
Chicago Wheel and Mfg. Company 65
Cleveland Universal Jig Company 79
Colonial Broach Co. .....
Colonial Bushings, Inc. 82
Columbia Tool Steel Co. 76
Conrad & Moser 78
Continental Machines, Inc. 35
Craley Mfg. Co., C. C. .....
Cullman Wheel Company 72

Danly Machine Specialties, Inc. 9
Danneman Company, F. C. 88
Darwin & Milner, Inc. .....
Davis Tool & Engineering Company 78
Dayton Rogers Mfg. Co. .....
Delta Mfg. Co. 21
Denning Manufacturing Company 79
Despatch Oven Company .....
Detroit Stamping Company 52
Detroit Universal Duplicator Company ..
Die Supply Co. 12
DoAll Co., Inc., The .....
Dresel-Betz Co. 78
Drive-All Manufacturing Co. ..Center Spread
Dumore Co., The 54
Duro Metal Products Company 22
Dykem Company 87

Enterprise Machine Parts Corp....37 and 78
Ex-Cell-O Corporation 11

Federal Tool Corp. .....71 and 78
Foley Manufacturing Co. .....
Ford Motor Co., Johansson Div. 55
Foredom Electric Company 87
Forging and Casting Corporation, The
.....Inside Front Cover
Foster Engineering Company .....
Fostoria Pressed Steel Corp., The 91
Fray Machine Tool Company .....

Gairing Tool Company .....
Gallmeyer & Livingston Co. 82
General Die & Tool Co. 79
Gerstner and Sons, H. 91
Gorton Machine Co., George 23
Grimes & Harris, Inc. 78
Grobet File Corp. 80

Hack Machine Company 14, 15
Hahn Manufacturing Company 79
Hamilton Tool Company .....67 and 79
Hartford Special Machinery Co. 76
Holo-Krome Screw Corp. 5
Hovis Screwlock Company 19
Hydraulic Hi-Speed Company .....

Illinois Tool Works 80
Industrial Machine Company, The 79

Jessop Steel Company 53
Johnson Gas Appliance Company 93

Kearney & Trecker Corp. 24
Kiffer Tool & Die Co. 79
Knu-Vise, Inc. 57
Koebel Diamond Tool Company 51
Koestlin Tool & Die Corp 94

Lakeside Steel Improvement Company .. 85
Leach Machinery Company, H. 63
Linderme Machine and Tool Company,
Inc. 83
Lufkin Rule Co. 84
Lyon Iron Works .....

Machinery Mfg. Co. .....
Majestic Tool & Mfg. Co. 78
Marburg Bros., Inc. 86
McGonegal Mfg. Company .....
McKenna Metals Co. .....
McKinney Tool & Manufacturing Co. 79
Michigan Chrome and Chemical Company 80
Motor Tool Manufacturing Co. .....

National Twist Drill and Tool Company. 47
New Method Steel Stamps, Inc. .....
Noble & Stanton 79
Northeastern Tool and Die Company 78
Norton Company 6, 7

Ohio Tool Company 79
Oliver Instrument Co. 66
O'Neil-Irwin Mfg. Co. 86
Onsrud Machine Works, Inc. 85

Paramount Tool Company 79
Peters Company, The 68
Phoenix Machine Company 79
Porter Steel Treating Company, Geo..... 89
Precision Spring Corp. 20
Precision Tool Company, The 91
Precision Tool Design Service 89
Producto Machine Company, The 10
Putnam Tool Co. .....Front Cover

Rane Tool Co., Inc. 78
Robbins Engineering Co. 78
Royal Oak Tool & Machine Company ... 78
Ryerson and Son, Inc., Joseph T. 45

Sal-Way Steel Treating, Inc. .....
Scherr Co., Inc., George 93
Schmidt Co., R. J. .....
Schraner, A. P. & Company 79
Severance Tool Mfg. Co. 50
Sheffield Gage Corporation, The .....
Smith Power Transmission Co., The ...
Sommer & Adams Co.....38, 39 and 79
South Bend Lathe Works 13
Standard Pressed Steel Company 59
Star Machine & Tool Company 74
Starrett Co., L. S. 46
Strong, Carlisle & Hammond Co. .....

Tannewitz Works, The 17
Timken Roller Bearing Company 8
Tomkins-Johnson Co. 64
Tools & Gages, Inc. 79

Universal Engineering Company 81

Variety Machine & Stamping Company.. 79
Viking Tool & Machine Corp.....58 and 79

Walton Company 83
Wayne Chemical Products Company 84
Wells Mfg. Corporation..Inside Back Cover
Wheelock, Lovejoy & Co. .....
Wittek Manufacturing Co. 73

Yohe Supply Co., Wm. S. .....

GS DIAL TEST INDICATORS

New rugged, simplified construction guarantees long life. Available with universal ball joint which makes it easy to set the indicator in practically any position on the machine. Write for bulletin on GS DIAL TEST INDICATORS showing various models available.

CALL AT BOOTH 241

Be sure to visit our booth at the Detroit show where we will exhibit the new COMPARITOL used to inspect parts, gages, bearings, pins, etc., to .0001" by means of a new, patented, knife-edge indicator. See the WILDER MICRO-PROJECTOR for measuring or comparing objects by means of a magnified shadow image.

ASK FOR LITERATURE.

Geo. Scherr Co. Inc.

128-B Lafayette St. New York, N. Y.

"2300° F. from a cold start in 30 minutes"

says R. A. Kaplan, president Owatonna Tool Co., Owatonna, Minn., of the

JOHNSON FURNACE No. 120

for Hi-Speed Steels

Pedestal Style...$129.50
Bench Style.....$104.50
F.O.B. Factory

An essential unit for all general machine and tool shops. Gives speedy, clean heating of all types of steel. *Carborundum hearth* is standard equipment, with burner flame below the hearth. Pyrex glass peek hole in front door permits watching operation without opening furnace. Temperature is easily regulated with air and gas adjustment. Equipped with General Electric Motor and large blower. Fire-box (13½" x 7¾" x 5") has 2½" insulating refractory lining. Unusually economical to operate. *Prompt delivery guaranteed.*

Available in other sizes, both larger and smaller.

SEND YOUR SPECIFICATIONS FOR QUOTATIONS TO THE

JOHNSON GAS APPLIANCE CO.

611 E Ave., N. W. Cedar Rapids, Iowa

Our 40TH ANNIVERSARY YEAR

JOHNSON GAS APPLIANCES FOR EVERY INDUSTRIAL PURPOSE

D

Johnson Gas Appliance Co.
611 E Ave., N. W., Cedar Rapids, Iowa
Please send me full free information on No. 120 Johnson Furnace.

Name .....
Address .....
City .....State .....

Do You Face "Tough" Delivery Dates?

Be Prepared with the *Grindrite* and its *Companion Work Bench*

SPECIFICATIONS:

Height .....Approx. 58 inches
Floor Space .....Approx. 29" x 33"
Weight .....Approx. 600 lbs.

Motor: 1 HP—1750 RPM—220 or 440 V. Grinding Wheels: 8" dia. 3½" face.

The *Companion Work Bench*, also portable, is equipped with vise and hand tools for layout, assembly or final fitting. Its use has multiplied in shops that have accepted Defense work, small or variable production jobs.

DIE SERVICE

Our die designing and building service is used by many large production manufacturers. We are particularly well equipped to design and build medium and large size dies. Our complete service includes a pattern shop and try-out presses.

Most shops are crowded with jobs that carry "must" delivery dates—skilled men are scarce—the equipment your regular men use must get the work out faster. Scores of leading tool rooms have learned what the *Grindrite* and its *Companion Work Bench* can do to help keep delivery promises — how valuable the *Grindrite* is for removing stock rapidly—grinding out small dies to line or template — reducing costly set-ups.

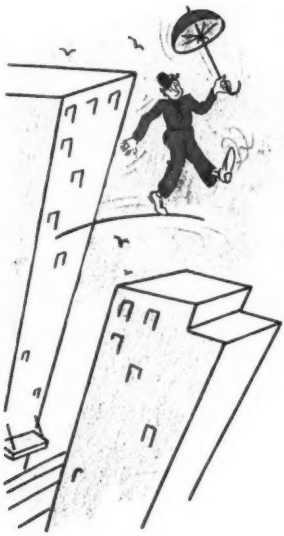
Being portable the *Grindrite* can be taken from job to job in the shop.

Catalog and list of users sent promptly on request

Largest Independent Die Builder

KOESTLIN TOOL & DIE CORP.

3601 Humboldt Ave. **Detroit, Mich.**



THERE'S NEVER A DULL MOMENT FOR A WELLS SAW!

Now Built in 3 Sizes

No. 5—5" dia. round or 5" x 10" flat.

No. 8—8" dia. round or 8" x 16" flat.

No. 12—12" dia. round or 12" x 16" flat.

Also the No. 9 Upright Saws.

A WELLS SAW in your plant will never get a rest! It's such a speedy, accurate, time and labor saver, you'll wonder how you got along without it. It's dependable, it's portable—it's a real all-around tool of 1001 uses in any spot in the plant:

1. **MAINTENANCE WORK** — There's plenty of that when plants are going full tilt. A Wells Saw will work wonders in emergencies when speedy work is essential. On routine work a Wells will save time, labor, reduce maintenance costs.

2. **GENERAL WORK**—For any metal cutting job in stock rooms, tool rooms or elsewhere the simplicity, speed and accuracy of Wells Saws will save time and money every day.

3. **PRODUCTION WORK**—For continuous all-day output, Wells speed, accuracy and rugged construction make it first choice for big output at low cost.

Put a Wells—the saw that saves—to work in your plant now. Write for complete details and literature.

SEE WELLS SAWS *in Operation at the* TOOL ENGINEERS EXHIBITION March 25-29

WELLS MFG. CORP., Three Rivers, Mich.

WELLS *METAL CUTTING BAND* **SAWS**

You can cut-off faster with a MARVEL SAW

For high speed, quantity production of pieces or lengths cut from bar stock, MARVEL Saws are unequalled. These heavy-duty all-ball-bearing sawing machines, with automatic bar push-up require no more attention than an automatic screw machine, yet produce more pieces per hour, floor-to-floor than any other cutting-off method.

They set new standards for fast cutting-off with accuracy and low cost per piece, on thin slices (as gear blanks) or long lengths (as rifle barrels).

These high speed "automatic" saws come in two sizes: MARVEL No. 6A, Capacity 6"x6", and MARVEL No. 9A, Capacity 10"x10". With the other MARVEL Saws, they comprise the most complete line built—a line that provides exactly suited saws for every purpose.

MARVEL SAWS

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People" 5700 Bloomingdale Ave., Chicago, U.S.A.
Eastern Sales Office: 199 Lafayette St., New York, New York

Buy from your local Distributor